ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

Formerly Review of Telegraph and Telephone.

Vol. 6, No. 5. WEEKLY. | NEW YORK, SATURDAY, APRIL 4, 1885. | $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

Patton & Machlin's Electric Arc Lamp Attachment.

It is claimed that this device converts any single carbon arc lamp into an "all night service lamp."

Several methods of constructing electric arc lamps have been invented to overcome the difficulties incident to the use of automatic tripping or double carbon lamps; the mechanical movements necessary to automatically put in service the reserve set of carbons, add to the complexity of lamp construction. Single carbon lamps, as a rule, are reliable; automatic double carbon lamps sometimes fail to act perfectly.

The invention here illustrated, dispenses with a duplicate set of carbons, as a single set of the ordinary length of 12 in. and 7 in., will last, it is claimed, nearly 16 or 18 hours, continuous use, give equal volume of light, burn steadily and brilliantly. An inspection of the drawing shows the simplicity of the device. Telescopically jointed sections of metal tube are attached at the upper end to a short flange on the under side of the feed case of the lamp by a bayonet lock, so that it can be quickly put in position or instantly disengaged. The lower end of the jointed tubular case is secured to a convexed cover that is provided with a circumferential edge of heat proof flexible packing, that bears upon the rounded upper outside surface of the globe, forming an air tight joint therewith. The globe rests upon a flexible or soft gum packing, and is held in close contact with it by an ordinary thumb screw and bearing pins, the action of which is to seal the base of the lamp air tight. The sections of the tube that slide internally, are provided with packing recesses cut in their outer surfaces near the upper ends of same, so as to make the movable sections air-tight throughout their length. An adjustable air gate is attached on the side of the upper tube near its top end, and in conjunction with an orifice in the wall of the pipe serves to control the escape of atmospheric air or gas generated by carbon combustion. A tubular inlet valve is attached to the base plate of the lamp, perforating it so as to convey a graduated volume of air into the base of the lamp This inlet passage, and the regulating exit valve at the upper end of the tubular case, permits the influx and escape of air to be critically controlled, and as the combustion of carbon is directly affected by the quantity of oxygen supplied thereto, it is obvious that the same can be regulated to suit the situation or requirements of the service.

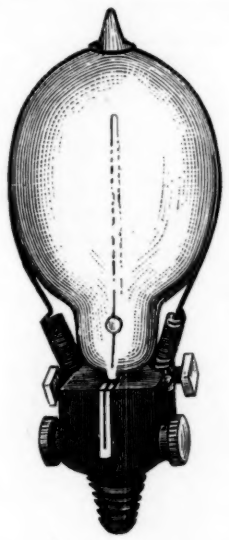
In this device is embodied a principle of operation different from any partial vacuum lamp, as by the introduction in graduated amount of atmospheric air at the base of the globe of the lamp, an upward current is established through the outlet valve formed in the upper telescopic tube, so that carbonic acid gas, (the result of close combustion,) is removed, and fresh oxygen in requisite quantity is furnished to afford perfect combustion, and this is regulated to prevent the undue or wasteful burning incident to carbons used in open globes.

The attachment can be instantly removed to permit the cleaning of the carbon supporting rod and also the glass globe, or the convex cover can be elevated by collapsing the telescopic tubes, so as to allow carbons to be put in position with ease. See advertisement for further particulars.

A New Lamp-Holder.

We have received from Messrs. Harrison, Cox-Walker & Co. a sample of a new holder for incandescent lamps, which has just been patented and is now manufactured by that firm.

A great amount of ingenuity is being generally displayed amongst electrical engineers in designing lamp-holders which are at



HARRISON, COX-WALKER & CO.,
NEW STYLE OF LAMP HOLDER.

once simple, elegant, and capable of making and preserving good electrical contact. The apparatus shown in the sketch appears to possess in the last important point considerable advantages over the bulk of such articles. Should, however, the lamp be at times subjected to any side movement when being handled, it might be expected that the platinum loops would break off; but this, of course, may be avoided by extra tenderness in manipulation.

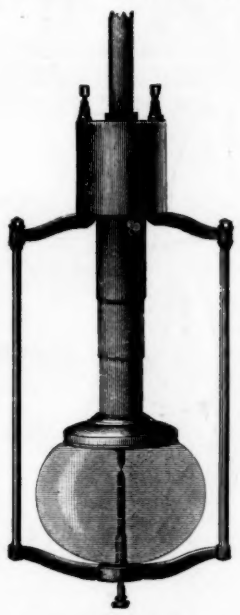
The patentees state that in nearly all lamp-holders hitherto made the small hooks which pass through the terminal loops on incandescent lamps give rise to a very considerable amount of resistance and consequent loss of light, owing to the exceedingly minute point of actual contact between them. Cox-Walker's new holder is so constructed as to make the best possible contact between the loops and the terminals in the holder; and, at the same time, it provides an additional support for the lamps where considered desirable.

The body of the holder is three-quarters of an inch square, with a deep groove across the middle, in which are fixed flat nipping springs or pieces of metal, to which the terminals are attached. The loops in the lamps are placed between the springs, and two milled-headed screws nip the springs together, and thus hold the loops by the sides perfectly tight, making the best possible electric contact.

The wire supports are made in various sizes to suit requirements, and add considerably to the appearance of the holder.—*London Electrical Review.*

The Page Patent.

A good many people will be surprised and a great many more will be pleased to learn that the famous Page patent covering telegraphic appliances has expired. This patent has for many years been the "bugbear" with which the Western Union Company has



PATTON & MACHLIN'S
ARC LAMP ATTACHMENT.

scared off its rivals or involved them in legal troubles from which very many of them were only too glad to escape. A dispatch from Washington says:

Having secured control of the patent upon the payment of $25,000 and a contract to give the heirs of Dr. Page one-half of whatever sums might be recovered in suits for infringements, the Western Union immediately began threatening all who were using the old Morse relay. Some of the leading railroads showing a disposition to enter into the telegraph business, threats were made to enjoin them from using the instrument if they granted facilities to any other telegraph company to do business along their lines. Similar threats were made against existing telegraph companies, and combinations were formed for defence. Suits were brought against two weak companies—the Deseret, in Utah, being one of them—with the purpose of procuring *ex-parte* decision, to be used as a basis for injunctions. This trick, however, was discovered, and, notwithstanding the "Page patent" was held as a red flag to frighten off competitors, the Western Union, up to the date of the organization of the American Union Telegraph Company, never dared to deliberately prosecute any claim for infringement to a decree. When Gould started the American Union Company, he and General T. T. Eckert treated the claim that they were infringing the Page patent as preposterous, and, while they made answer in court, they ridiculed the notion of an injunction being granted. When, however, Gould had obtained control of Western Union himself, he and General Eckert brought similar suits against the Mutual Union and the American Rapid Telegraph companies. These companies simply took the answer prepared by Gould and Eckert in the former suits, and filed it as their own reply to the alleged infringement. Nothing has since been heard of the suit, and now the expiration of the patent consigns it to oblivion.

Standard Time by Electricity.

At Hartford, Conn., both Houses have passed a bill to repeal the appropriation of $2,000 a year to continue the time service furnished from Yale College Observatory. The Hartford *Press* says that they think they erred in so doing, and that the State will be the loser by it. There are three lines running from the Observatory—one to the general railroad office in New Haven, another to the Western Union Telegraph office, and a third to the Southern New England Telephone Company. There is also a line to the Connecticut River Telegraph Company. To every station reached by these companies the Observatory sends the standard or 75th meridian time—always twice daily, in many instances four times. Its value to the business and people of the State can hardly be overestimated.

Connecticut first demonstrated the practicability—we may say, the possibility—of this uniform improved time service. She will probably cut but a sorry figure, to "go back on" it now. Its value, as now rendered, to the State may be seen in this, even more than in the primary importance of its use to railroads and factories—that now, in every shop, mill or place of business—every grocery store, we might say, the man who looks up at the clock knows that that clock gives the true time; the time by which all business, and all plans for travel, must be regulated throughout Connecticut.

The whole clock industry of our State looks directly to the Observatory and to this arrangement; as to the railroads, they would be all at sea without it.

It has been said in the House that the Western Union Telegraph Company would do this service for nothing, and that the Navy department would assist. This is a mistake. The statement is untrue.

It is said that the reason given by some members of the House, for voting to repeal this appropriation for the time-service, was a wish to "give that Mugwump College a slap." This is discreditable to the men who acted on such a reason. The repeal of the time-service appropriation will in no way hurt Yale College; it will only injure the interests of the public. Besides that, it is a question which properly has, and should have, nothing whatever to do with party politics or their revenges.

Mr. Frank T. Wyckoff, of Williamsport, Pa., has received a contract from the Western Union Telegraph Co. to furnish them with patent wooden casing for encasing over 400 miles of wires underground at Washington, D. C.

On the Resistance of the Electric Arc.

By W. Peukert.

Concerning the alteration in the resistance of the galvanic arc in accordance with its length, we have the former investigation by Edlund,* which was carried out merely with battery currents, and which led him to the assumption of a counter electromotive force, or of a polarization in the arc itself. More recently† we have the researches of Dr. Fröhlich, which gave for the connection between difference of potential (measured at the carbon electrodes) and the length of the arc a linear equation, applicable also to the resistance of the arc when it is represented as a quotient of the potential difference and the strength of the current.

The values for difference of potential and length of arc used in constructing this equation were obtained with different strengths of current, and it seemed desirable to carry out certain experiments with a constant strength of current so as to eliminate one of the three variables, *i.e.*, strength of current, difference of potential, and length of arc.

The experiments about to be described were conducted in the electro-technical laboratory of the Technical High School at Berlin I must express my best thanks to the superintendent of this laboratory, Prof. Dr. A. Slaby, who most courteously placed the necessary appliances at my disposal.

The current was generated by a compound dynamo by Siemens and Halske, and the measurement of the strength of the current was effected by means of a Crompton and Kapp's amperemeter, which instrument had been previously tested as to the accuracy of its indications.

The carbons, at which the difference was measured in a direct manner with a Siemens and Halske torsion galvanometer, were in a differential lamp (Hefne-Alteneck's system), in which the mechanism for regulation was introduced, so that the lamp served merely as a carbon holder.

The determination of the length of arc was effected by projecting the distance of the two carbons upon a millimeter scale placed close behind them in such a manner that as soon as the strength of the current and the difference of potential had become constant the current was interrupted, and the mutual distance of the carbon was assumed as the length of the arc. A direct measurement of the arc itself always gave too small values, in consequence of an action of irradiation produced by the strongly ignited positive carbon. As the formation of a crater in the positive carbon made accurate measurements difficult, the ends of the carbon were leveled with a file before each experiment, and remained so during the brief time required for reading off. Before each experiment the carbons were brought near the distance intended, and the transition of the current was effected by a small carbon rod placed between them.

The values obtained in these experiments are collated in the following series:

Series 1.

Strength of current in amperes.	Difference of potential in volts.	Length of arc in millimeters.	Difference of potential. / Strength of current.
Constant 10	39	1	3.9
	41	2	4.1
	45.5	4	4.55
	50	6	5
	54.5	8	5.45
	57.5	9	5.75
Series 2.			
Constant 15	43.5	4	2.9
	45.8	5	3.05
	49	6.5	3.26
	55	9	3.66
	57	10	3.8
Series 3.			
Constant 20	42	4	2.1
	47	6	2.3
	48	8	2.4
	51	10	2.55
	54 5	12	2.72
	57	14	2.85
Series 4.			
Constant 25	44	6	1.76
	46	7	1.84
	47.5	8	1.9
	51	10	2.05
	55	12	2.2
	60.5	14.5	2.42
	63	16	2.52
	72	20	2.88
Series 5.			
Constant 30	57	7	1.9
	57.5	8	1.91
	60	10	2
	62	11	2.06
	65	14	2.16
	66.5	15	2.21
	69	18	2 3
	70	20	2.33

* *Poggendorff's Annalen*, Vol. 131, page 586.
† *Elektrotechnische Zeitschrift*, 1883, page 150.

The quotients of the differences of potential and the strength of current as given in these tables may be considered as the apparent resistance of the arc. The variation of this resistance with the length of the arc is shown in the diagrams 1 to 5, constructed by plotting out the lengths of the arc as abscissæ and the resistances as ordinates. The lines connecting the points thus obtained have in the five series of experiments the character of right lines, so that for the apparent resistance, which we may call w, there is obtained an equation of the form

$$w = a + b\,L \qquad (1)$$

If in each case we determine the numerical values of the constants, a and b, we obtain the following equations:

$$\left.\begin{array}{lll} \text{Current of 10 amp.,} & w = 3.66 + 0.23\,L \\ \text{“} \quad 15 \quad \text{“} & w = 2\,3 + 0.15\,L \\ \text{“} \quad 20 \quad \text{“} & w = 1\,8 + 0.08\,L \\ \text{“} \quad 25 \quad \text{“} & w = 1.3 + 0\,075\,L \\ \text{“} \quad 30 \quad \text{“} & w = 1.6 + 0.04\,L \end{array}\right\} \qquad (2)$$

Only the first four of these equations can be compared with each other, as in the last series fresh carbons were used, the nature of which may not have been without influence on the numerical values of a and b.

The equations (2) show that the apparent resistance of the arc is composed of two parts, a constant part which varies only with the strength of the current, and a second portion which increases proportionally to the length, and can thus be considered as the true resistance of conduction in the physical sense of the word.

If we, in interpreting the constants, a, of the equation (1), assume a resistance of transition in the arc for the passage of the electricity from the carbon to the air, and if we call this resistance per unit of section, U, we have the equation

$$w = \frac{U}{Q} + \rho\,\frac{L}{Q} \qquad (3)$$

ρ being the specific resistance of conduction, and Q the section of the arc. The numerical values which the first four equations in (2) give for $\frac{U}{Q}$ show with sufficient accuracy an inverse proportionality to the strength of the current, thus confirming Fröhlich's assumption in the treatise above cited that the section of the arc increases proportionally to the strength of the current. If we put $Q = a\,J$, then

$$w = \frac{U}{a\,J} + \frac{\rho\,L}{a\,J} \qquad (4)$$

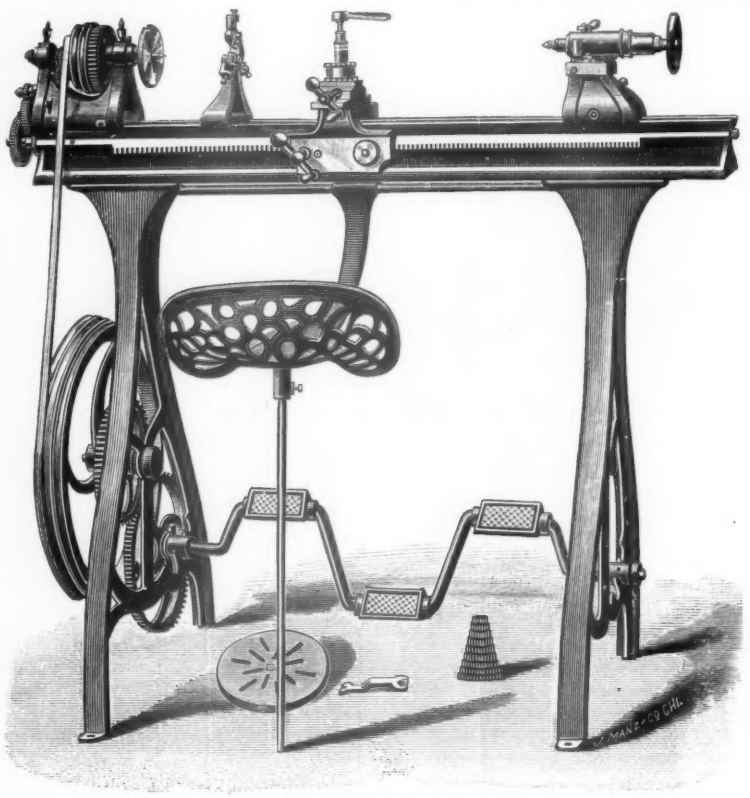
consequently the coefficient of $L\ b = \frac{\rho}{a\,J}$.

The equations (2) show that b declines more rapidly than the strength of the current increases, which was to be expected, as in strong currents not only the specific resistance of the carbon declines in consequence of the attending elevation of temperature, but the atmospheric air becomes a conductor, and as such must here be taken into account.

If, on the other hand, we assume a polarization in the arc, the value resulting for it would be $a\,J$, as the difference of tension measured at the carbons $w\,J = a\,J + b\,L\,J$. If we determine this value from the first four of the equations (2), we obtain a mean value of nearly 35 volts. The value thus obtained for this polarization being considerably greater than all polarizations hitherto known, tells against this assumption. If we, with Edlund, regard as the chief cause of the counter electromotive force in the arc the development of electricity effected by the mechanical subdivision of the two carbons caused by the current, the value of this polarization, according to all known experiments on the excitement of electricity during the mechanical division of bodies, is far too great to be thus explained. On the other hand, in consequence of this division, as the mechanical effect of the current increases with its strength, the counter electromotive force must also increase with the strength of the current. But this, according to the experiments given, is not the case; they show a constant value for such a polarization.

If we refer the excitement of electricity in the arc to the thermo-electric action in consequence of the unequal temperature of both carbons, or to the circumstance that the carbon electrodes become covered with the oxygen, or respectively hydrogen produced by the decomposition of the watery vapor in the air, so considerable a polarization cannot be thus explained.

Much more likely is the view that of the total resistance of the arc which presents itself as the relation between the difference of tension and the strength of the current, a part only comes into consideration as the true resistance of conduction, whilst the other, and considerably larger, portion is a pure mechanical resistance, the overcoming which is a part of the work of the current. Even the circumstance which speaks most strongly in favor of the assumption of polarization—*i. e.*, that a certain minimum tension must exist for the origination of the arc—can be very simply explained by the circumstance that a certain tension is necessary to loosen the particles of carbon, which then effect a conductive connection between both carbons, and thus render the production of the arc possible. — *Zeitschrift fur Electrotechnik.*



No. 5.—Barnes Lathe.

The Paper Currency and Gold and Silver Coinage of the World.

Below we present some very interesting data relating to the paper currency and the gold and silver coinage of the world. It would be well were our mono-metallists and bi-metallists to consider more fully and intelligently the facts and figures which history gives in regard to the two metals—the relation they bear to each other and to the paper money issues of the world.

From 1492 to 1884 the total product of the two metals, gold and silver, has been as follows:

Gold	$6,660,000,000
Silver	7,800,000,000
Total	$14,460,000,000

The total coin circulation of the world for the same time is given at, in

Gold	$3,293,606,836
Silver	2,754,610,712
Total	$6,048,217,548

Between the production of the metals and their circulation during the long period noted there is a difference of $8,411,782,452, or over 58 per cent of the product has been used in the arts and manufactures, and lost or hoarded.

The total paper circulation of the world at the present time is computed as follows:

By Governments	$1,196,158,368
Banks	2,752,498,039
Total	$3,943,656,407

The coin reserves for this is as follows:

Governments—Gold	$296,134,493
Silver	310,660,504
Banks—Gold	929,079,031
Silver	345,705,312
Total	$1,881,579,340

This shows an excess of paper issues above the coin reserves of the world of $2,062,077,067, or over 50 per cent.

The United States Government has in circulation paper issues, legal tenders, gold notes, and silver certificates to the amount in round figures	$537,597,537
Do., banks	635,829,228
Total	$873,426,765

Against which there is the following coin reserve:

Government—Gold	$217,904,042
Silver	176,467,351
Banks—Gold	127 682,848
Silver	11,978,833
Total	$534,033,074

This shows a difference between the paper issues and the coin reserves of the United States Government and the banks of $339,393,691, or over 50 per cent. more paper in circulation than we have the coin to redeem it with.

The indebtedness of the Government of the United States amounts to nearly	$2,000,000,000
That of its principalities and railways to	6,000,000,000
Total	$8,000 000,000

The last ten years has shown that the annual output of the world of gold has fallen from about $150;000,000 to $90,000,000, while that of silver has increased from $80,000,000 to $120,000,000.

In view of the present agitation relative to the coinage of silver in this country, the foregoing facts and figures will furnish some very interesting deductions, no matter which way they be considered.—*U. S. Economist*

Foot-Power Machinery.

COMPLETE OUTFITS OF FOOT-POWER MACHINERY FOR PRACTICAL USE IN WORKSHOP BUSINESS.

Only a few years ago, comparatively little attention was given to foot-power machinery. Its usefulness was limited to the narrow capacity of the old crank and treadle motion, which had remained unchanged from the time of the ancient Egyptians. Good mechanics, being well aware of the defects of this old motion in driving machinery, knew that they could accomplish nothing with it in actual business to pay for the expense of such machines When the Barnes machines were offered to those having use for machines for foot-power machinery, they were an entire surprise to all who tested them. Such was their power and utility, that the accurate statements given by those using them were not at first credited. Only actual trial would convince, and now the old established prejudice is yielding to the fact that foot-power machinery is a success in actual business.

The W. F. & John Barnes Co., of Rockford, Ill., have secured some fourteen patents upon the various styles of foot-power machinery manufactured by them.

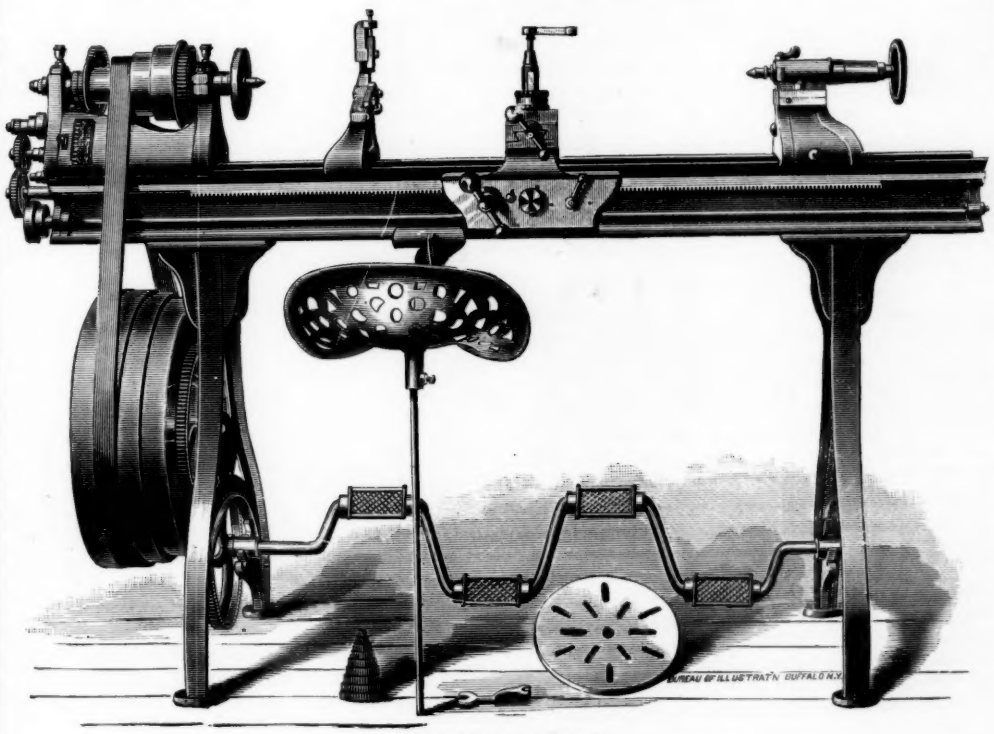
These inventions have made a radical revolution in foot-power machinery. They have been thoroughly and successfully tested in actual workshop business, and have developed new and practical methods which no other machines can have or use. They meet the needs of good mechanics for practical foot-power machinery without dead centers, with a positive motion, always in the right direction, and with the largest economy of power. In these machines the pressure of the foot can never retard the motion already gained, but, on the contrary, sends more power from the treadle to the work than is possible with any old-fashioned machine. They *have no dead centers* to pass, and therefore no necessity to press the treadle at exactly the right point and raise the foot at exactly the right moment. In all old-style machines the operator must do this or else retard the motion, and often cause it to stop by a wrong pressure; but with these patent foot-power combinations any pressure of the foot upon the treadle, whenever made, always develops a machine motion in the right direction, and always adds to the working power. This great advantage all good mechanics at once appreciate. It is not claimed that these machines generate power in themselves; no combination has ever yet done this.

We illustrate herewith what is termed by the manufacturers, their Nos. 4, 5, and 6 lathes.

The No. 4 Lathe is designed for turning both wood and iron, and for boring, drilling, polishing, etc. It is not an amateur tool, but is strictly mechanical in every respect. It is of a desirable size for small work, and has many important advantages in the construction and arrangement of its parts. It will take in work 7 inches in diameter and 20 inches long. Having a patent velocipede foot-power and improved seat, the operator sits comfortably in the best possible position for the management of his work, and he can work steadily without fatigue. The speed can be varied from 1,000 to 2,000 revolutions per minute, and the motion can be started, stopped, or reversed, instantly, at the will of the operator. Greater power can be applied on the work than with any old style foot-power, and with greater ease. The seat can be moved readily along to any part of the bed that the work requires, although, as the bed is short, it is seldom necessary to change. The lathe is made entirely of iron and steel. The bed is solid, and has V-shaped projections, over which the head and tail stocks and hand and slide-rests are fitted. The head stock spindle has taper bearings, and can be adjusted with as much delicacy as a jeweler's lathe; that of the tail-stock is moved by a screw and hand-wheel. The head and tail stocks are made of cast-steel, and have truly fitted taper-centers, and that of the tail-stock is self-discharging.

No. 5. Lathe swings 9 inches on the face-plate, 5 inches over the tool carriage, and is 34 inches between centers. Having the Patent Velocipede Foot-Power, and improved seat, the operator sits comfortably in the best possible position for the management of his work, and can work steadily without fatigue. Motion can be started, stopped, or reversed instantly at the will of the operator, and from one-fourth to one-third more power can be applied on the work than with any old-style foot-power, and with greater ease. With its back-gearing and cone-pulleys the lathe has a great range of speed.

No. 4.—LATHE.



No. 6.—BARNES LATHE.

It is thoroughly and substantially built of iron, steel, and brass, each used where it will best serve All the works are securely protected from chips and dirt, thus insuring long wear and durability to the most costly and vital parts of the lathe. The gearing furnished can be combined to make some 500 different leads of thread. As a screw-cutting lathe it is simply perfect. All the gearing (except that in the foot power) is cut from solid metal in the best machinery known for gear cutting, and is as true and noiseless as it is possible for metal gearing to be.

The No. 6 Lathe is designed for those wanting a lathe for general work with a greater capacity than the No. 5 lathe, and yet within the range of foot-power. It swings 12 inches on the face-plate, 6 inches over the tool-carriage, and is 44 inches between centers. It has all the necessary appliances for rapid and accurate execution of both light and heavy work.

The No. 6 Lathe has a capacity greater than any foot lathe that has ever been placed upon the market, the velocipede motion giving a greater range, and allowing a man to do work that other foot powers cannot be made to do. This lathe will do as small work as any foot-lathe, and yet has a range of work to the extent of what can be done by foot-power. It has both rod and screw feed. It is fitted in the most thorough manner in all of its joints and bearings.

Oxidation of Oil by Electricity.

Herrin Muthel and Lutke, of Berlin, have devised a process for oxydizing rapidly, with the help of electricity, the oils employed in the manufacture of varnish. Oxydated combinations of the metalloids, which, by an elevated temperature, lose part of their oxygen, are formed by the influence of electricity. Suitable for this purpose are mixtures of equivalent quantities of chlorine and vapor of water, sulphurous and atmospheric air, oxygen, or hyponitric acid, protoxide of nitrogen with air or oxygen. Such a mixture of gas is submitted during some time, in condensing apparatus, to a strong electric discharge, produced by a dynamo and an induction apparatus. In this manner 2 H Cl and O give birth to Cl2 and H2O, and S2O7 form by electrification a mixture of SO2 and atmospheric air. This combination easily resolves itself into 2 SO2 and O, etc. The linseed oil to be oxydized is warmed in a vessel to 60 deg or 80 deg. Centigrade. Oxydated gas is sent through the oil while it is being agitated, and the decomposition of the glycerides is rapid. The products of decomposition are regenerated or burnt; and the clear product is washed with ammoniacal water.

Electric Lights in Railway Cars.

The experiment of lighting cars on the New York and New England Railway, by means of incandescent lights has proved very satisfactory. The apparatus was put into the car by the Domestic Electric Light and Power Company, of Boston, and consists of three Trouvé batteries, each consisting of six cells. The lamps are twelve in number, each of about eight candle-power. It has been found by experiment that the best results are attained when two of the batteries have the zincs and carbons fully submerged, while in the third their ends only are dipped in the solution. Operated in this way, it is found that these three batteries will operate the twelve lamps for eight hours without running down. The run of the train is so timed that light is required for about four hours, and in practice the batteries answer for two trips, without renewal of the liquid, which is the usual Trouvé solution. The cost of enough solution to run twelve lamps eight hours is something less than a dollar, so that the expense is just about one cent per lamp per hour. So far the trial has proved in every way satisfactory, and there would seem to be no good reason why it should not be very generally introduced on railroad trains. In the Pullman cars, where the lighting is all at the top, and is screened from the seats by the heavy bodies of the lamps and the frames which hold them, such illumination would indeed be a boon. This same company has all the rest of the Trouvé appliances and inventions, and is specially at work on the Trouvé motor, which it has very greatly improved. It seems at last to have got down to a thoroughly business basis and we shall expect to see practical results in all directions very shortly.

Absorbing the Extra Current of Dynamos.

London *Engineering* recently described the application of secondary batteries by M. d'Arsonval to the absorption of the extra current when a dynamo circuit is broken, and the prevention of injury to life by the physiological effects of that current. At a recent *seance* of the French Academy of Science, M. A. Daussin claimed priority for this application on the score that in 1869 (March 25th) he patented the application of these batteries to the absorption of extra sparks in the opening and closing of a relay, and the prevention of decay in the points of contact. He then observed that the suppression of the extra current was proportional to the electromotive force of polarization of the volta-meter intercalated. On this subject M. J. Raynaud suggests the use of lateral induction lightning protectors, such as are used in telegraphy to withdraw the extra spark at the moment of rupture. It would be sufficient, he points out, to connect to the poles of the dynamo machine an apparatus of this kind which would form a safety valve allowing passage to the current at the instant it became dangerous. He mentions, as apparatus to be used, the plate lighting protection with insulating layers of paper, air, etc., between, or the vacuum discharges in some cases. Such appliances were also patented in England in 1882 for the prevention of sparking with dynamos.

Mr. McDonald, of the Jenney Company, has sold two focusing lamps to be put on a Mississippi River boat. He has also sold and put up a 16-light Jenney plant to the Hotel Royal, and one of 30 lights for the Battle of Sedan Panoramic Company at New Orleans.

The Efficiency of the Woodhouse-Rawson Lamp.

According to a series of tests made at the Vienna Exhibition by a jury, consisting of Dr. Erasmus Kitler, Dr. Antonio dos Santos Viegas, Dr. Josef Haubner and Dr. E. Maiss, the Woodhouse and Rawson 20 candle-power incand scent lamp has the remarkable efficiency of 3.77 watts when run at 9 candle-power, and 3.3 watts at 11 candle-power. The average efficiency of the tota number of lamps tested is 2.38 watts per candle-power, or 312 candles per electrical horse-power, the observed candle-power being 20.78; the current, 1.072 amperes; the difference of potential, 46.26 volts; and the hot resistance, 43.71 ohms. These tests agree very well with those of Mr. Preece, made later upon lamps of a somewhat improved manufacture. The life of these lamps does not appear to have been tested at Vienna in New Orleans.

—— A central station has been established in Batavia, N. Y., for the supply of arc lights. The Brush system is used.

ELECTRICAL REVIEW
ILLUSTRATED
A WEEKLY JOURNAL OF
ELECTRIC LIGHT TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

Published at 23 Park Row.

P. O. BOX 3329.

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SUBSCRIPTION.

United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.

Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.

Transient, 25 cents per line, nonpareil.

EDITORIAL ANNOUNCEMENT.

Address all communications and make all checks and P. O. orders payable to order of ELECTRICAL REVIEW P. O. Box 3329, New York.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

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NEW YORK, APRIL 4, 1885.

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The Massachusetts legislature is loafing through its session, and is more disposed to talk than to work. A report has been submitted covering a bill compelling telephone companies to lease instruments and give connection, at regular rates, to all applicants, including, of course, telegraph companies. Whether the bill will become a law or not is still a question. The movement to secure the passage of a bill "regulating" telephone rates seems unlikely to succeed, and it does not now look as though the increased capitalization asked for by the Bell Company would be granted.

It is amusing to read, in the accounts that come from the army in Egypt, that on a recent occasion a captive balloon was sent up, and that the aeronauts, who were British officers, were, *on their return to terra firma*, able to give very valuable information as to the location of the enemy and the character and position of their works. In war everything depends upon the promptness with which information is received, and, considering that English officers are no doubt as well aware of this as any one, it is surprising that it did not occur to them to provide the officers in the balloon with telephones, connected with the earth by means of conductors carried along the restraining cable, so that while they were in the air they could hold conversations with the officers below, answer questions and communicate information which might be of immediate value. With such help, it ought to be easy to regulate the range of guns so as to make their firing tell, to detect at once any weak spots in the opposing lines, and, by giving immediate information, to enable the commanding officer to take advantage of them. During our own war it more than once happened that signal officers placed in positions commanding extensive views, as, for instance, on the summit of Cedar Mountain, were able, by signal flags, to give information concerning the enemy's movements, which was of the utmost value. But the trouble was that such signals were very apt to be read and understood by the enemy, who were thus placed on their guard. Secrecy and despatch are all important in communicating military information, and, in cases where it can be used, nothing is more effective for this than the telephone. In the event of a great war in Europe, we shall expect to see balloon corps employed on both sides as a means of obtaining information concerning the position, strength and movements of the opposing force, and we shall be greatly surprised if a liberal supply of telephonic apparatus does not constitute an important item in the outfit.

THE TELEPHONE "MONOPOLY."

To read some of the papers just now, one would suppose that not only was the Bell Telephone Company a grasping and insatiate monopoly, but that the men who control it were utterly lost to all sense of business decency, and given over entirely to an endeavor to wrong everybody out of their just dues. This is the impression that is fairly to be got from an elaborate article which has come under our notice this week, in which a vast deal that is untrue is blended with a very little that is true, and so carefully blended that it is by no means easy for one not informed on the subject to separate the false from the true.

That the Bell Telephone Company has a monopoly of the telephone business in this country is unquestionably a fact. The value of its patents consists very largely in the fact that they give it that monopoly. The patent laws are specially enacted to encourage inventors by promising them, and securing to them, the exclusive benefit of their inventions for a term of years, so that they may reap the fruits of their ingenuity. It is optional with them, after having secured a patent, to dispose of a whole, or a part of it, or none of it, as suits their wishes, convenience and interest, and the law provides a method by which this may be done. Monopoly is the very essence, the life blood of the patent law, and to say that the owner of a patent or of patents is a monopolist, is simply to say that he is exactly what the law intended he should be.

When a man applies for a patent he claims all that he can, "everything in sight," it may be. The Patent Office examines his claims, and refuses such as it cannot allow. Those which it does allow go into the patent, and these things are secured to him so far as a patent can secure them. If others who have previous patents feel that their rights are trespassed upon, they have a remedy at law, and the courts, which are provided for the purpose of determining questions of fact and of law, stand ready to decide the matter. It is a common saying that a patent is of but small value until it has been contested in the courts and its validity judicially established; and, by parity of reasoning, it may be said that, when a patent has been passed upon by the courts, and has had its validity established, it is a piece of property having substantial value, a value proportioned to the importance and usefulness of the invention which it covers.

The telephone patents owned by the Bell Company are very numerous and important. The foundation claims of the principal patents of the group have been contested in the courts very many times, and in every instance they have been sustained. They have been assailed on all sides and in every conceivable way, but the victory has always remained with the Bell Company, and, unless we are to assume that our courts are instruments of injustice, it is fair to suppose that the decisions have been in accordance with the law and the facts. It is these which, as judged and interpreted by the courts—the only machinery we possess for getting at the truth—which have given the Bell Telephone Company the monopoly which it undoubtedly possesses.

It is easy to arouse indignation among the unthinking and uninformed by shrieking "monopoly," especially if such words as "giant" or "grinding" be coupled with it. Now, a monopoly is a monopoly, and whether it be large or small, a giant or a pigmy, does not at all affect its quality. "Giant" is a good word, perhaps, but it need frighten no one. When it comes to "grinding," the case is different. It implies oppression—an oppressive use of the power possessed. In the case of the Bell Company this could only be done by inordinate and excessive charges for the use of their instruments. The sole question is, therefore, are their charges excessive, or even unreasonable? That is the whole question.

The measure of the value of a thing is its usefulness or desirableness. Not that cost is to be left out of the question, but in the case of patented articles it is of minor importance. If but one form of sewing machine had ever been invented, and it actually cost the owner of the patent but two dollars to make one, that would be but an unimportant factor in determining the price that the public should pay. True, the inventor could make it at an expense of two dollars, *but nobody else could make it at all.* He, owning a monopoly, would be justified in putting such a price upon it as would, according to his best judgment, best promote his interests, high enough to be remunerative, but not so high as to limit its sale, and the sole question which he would have to consider would be one of self-interest. Just so with the telephone company. It owns the monopoly, hard and fast. It has fought for it, and has poured out money like water to defend and protect it. And it *has* protected and secured it. The question of rates it must determine solely on the basis of its own interest. If it puts the figure too high, it will have but a small business. If it puts them too low, it will have a large business which may be unremunerative. Its natural endeavor is to fix them at such a figure as will induce the public to use the telephone freely, and yet yield a satisfactory revenue. The only possible way of determining whether the rates charged are or are not too high, is to put them to the test and see whether the public considers that they are in excess of the value of the service rendered. If they be so, the public will refuse to subscribe, and the company will be the sufferer, not the public.

A NEW ELECTRICAL COMPANY.

Since our last issue went to press, the details of the organization of the American Electric Manufacturing Company, already mentioned in these columns, have been made public. The company is organized under the laws of this State, with an authorized capital of $3,000,000, divided into 30,000 shares of $100 each. The corporators are as follows: Hon. H. S. Hyde, President Agawam National Bank, Springfield, Mass.; H. P. Frost, General Manager Southern New England Telephone Company, New Haven, Conn.; Charles B. Whiting, of C. B. Whiting & Co., bankers, Worcester, Mass.; Colonel Silas Gurney, proprietor Tremont House, Boston; A. B. Chandler, of the Mackay-Bennett Telegraph Combination, New York; Charles F. Cutler, president New York and Pennsylvania Telephone Company, New York; Henry M. Gillig, General Manager American Exchange in Europe, New York, and London, England; W. H. Baker, of the Western Union Telegraph Company, New York; Edward H. Goff, president American Electric and Illuminating Company, Boston.

It is understood that Mr. Goff is to be president and general manager of the new company, and that Mr. Baker is to be secretary and treasurer.

Personally, Mr. Goff, who may fairly be said to be the leading spirit in the new enterprise, has not been very well known outside of New England, which has been the chief field of his endeavors. By reputation, however, he is well known to the whole electric lighting fraternity all over the country. He is a man of indomitable energy and perseverance, one whom no amount of difficulty can discourage, and who is always at his best when he has a fair amount of opposition to contend with. From small beginnings and with the most determined opposition on the part of his competitors, he started his company and began business. None of his associates could see the remotest chance for success, everybody predicted disaster, people who took stock in the company were derided as deluded fools; but Mr. Goff kept right on, working anywhere from sixteen to twenty hours a day, and never frittering time away in discussing the probabilities of success or failure. Before his company's business was fairly established in Boston, work in other cities in New England was projected, and the result is seen in the large plants now in operation within their limits. If we were asked to state briefly the causes which, in the face of opposition which would have discouraged ninety-nine men out of every hundred, have led to Mr. Goff's success, we should say, first, a clear head; second, an extraordinary capacity for work; third, invariably keeping his word. The first of these has enabled him to see opportunities, the second has enabled him to take quick advantage of them, and the third has made him hosts of friends, who have been ever ready to stand by and lend a hand.

Mr. Baker, who is to be secretary and treasurer of the new company, is well known in electrical circles. He was secretary and treasurer of the Atlantic & Pacific Telegraph Company under Mr. A. B. Chandler's presidency, and is to-day assistant secretary of the Western Union Telegraph Company. There are but few who have so extended an acquaintance among people interested in electrical enterprises.

The other gentlemen whose names appear as members of the governing board need no introduction to our readers. They are all prominent and successful men in their respective fields, and their association in this new enterprise is, in itself, almost a guarantee of success.

With regard to the work of the new company, it may be said that it will doubtless absorb the American Electric and Illuminating Company, and carry on the business in which the former has been so successfully engaged. We have reason to believe that it will form a very close business alliance with the Edison Company, and that it will engage very largely in the manufacture of all apparatus, appliances, and supplies needed by electric lighting companies.

We are glad to welcome this new company to the field. There is work enough for all if they will but seek it, and do it at rates which, while properly remunerative, are not so high as to discourage people from using the electric lights.

The new company has taken offices in the new Western Union building, corner of Twenty-third Street and Broadway, opposite the Fifth Avenue Hotel, where it will be fully installed and ready for business within a very few days.

Senator Mahone has made a report from the Committee on Public Buildings and Grounds favoring the substitution of electric for gas lights in the Senate.

General Western News.

The fire on Saturday night last, which thoroughly destroyed the Langham Hotel, Wabash avenue and Adams street, was peculiarly fruitful in painful incidents. Five lives, at the least, were lost, two of which were claimed to be the result of circumstances in which overhead wires are a very prominent factor. The fire patrol gang were nearly all buried beneath a portion of one of the walls. The assumed cause of the accident was a wire rack on the roof, to which somewhere between seventy and a hundred wires for telephone or telegraph purposes were attached. The equalized strain upon these in their normal condition of course was comparatively harmless; but, as luck would have it, the wires on one side of the rack were destroyed by the fire, and the pull being then all in one direction, of course, the wall, already bulged by the expansion on the hot side, could not withstand the strain, and the melancholy result was a natural consequence.

The unwarranted appropriation of roofs by wire stringers of all telephone and telegraph companies has always been a source of great annoyance and detriment to property owners, but this phase of the question, it would seem, calls for attention on the part of corporations, as a very dangerous element of the overhead muddle. While there is no doubt that a large water tank on the roof probably aided in the fatal consummation of the accident, yet, on the principle that "two wrongs never make one right," there is none the less responsibility on the wire rack side of the matter.

He is an unjust judge, who refuses to accept or at least to hear the defence. The following is the telephone company's side of the story. By way of parenthesis, however, it is well to mark the distinction between *weight* and *strain* in the case under consideration. From the *News:*

"CHICAGO, March 23—*To the Editor:*—The theory published in the morning papers that the south wall of the Langham Hotel building was pulled over by the telephone wires does not stand examination. About sixty-five phosphor-bronze wires stretched southward from the Langham Hotel building, some crossing Wabash avenue, and others to Montgomery Ward & Co.'s store, 150 feet south of the hotel. These wires are very small, weighing forty pounds to the mile, and the combined weight of all of them would not exceed 100 pounds. The telephone frame sat loosely on the roof and was not bolted to the wall. Moreover, the wires to the north did not break until after the wall fell, when they hung from the cornice of the hotel all the next day and Monday. If the telephone wires had pulled hard enough to move the wall they would have toppled the frame over first, because it was not fastened to the roof or wall, but as a matter of fact the wall fell first and the frame fell after it through the roof of Hilger's building, and is still to be seen in the ruins there on top of the rubbish and almost uninjured. C. N. FAY.
"General Manager Chicago Telephone Company."

Whether or no, the danger of mischief is not lessened by the fact that in individual cases no harm has been done by roof fixtures.

Speaking of fires, East Saginaw, Michigan, has just accepted a proposition from the general Western agent of the Gamewell Fire Alarm Telegraph Company, Mr. E. B. Chandler, and will shortly avail themselves of this great preventive to destructive conflagrations.

Twenty boxes, with fire gongs, are to be placed on about fifteen miles of wire, with a two-circuit automatic repeater, all of the latest and most improved forms, and put up in the highest style of the art.

The underground muddle is just entering a new phase of complexity. On the 24th inst. the Chicago Electrical Underground Company asked, in the United States Court, a judgment against the Postal Telegraph Company for the snug little sum of $35,000, and also begged an injunction on the Bankers and Merchants' Company preventing them from placing any more conduits and wires beneath the streets and alleys of the city.

In plaintiff's leased rights of way in 1884, in certain territory on the South side, to the B. and M. folks, with a provision in the lease forbidding the sub-leasing of the franchise. At the same time the Postal Company in consideration of $35,000, in its bonds at 60 cts., received a similar concession in the south division. The Postal Company now claims a right to, and is charged with using certain conduits of the B. and M. folks, having purchased this right and the plaintiff charges conspiracy on the co-dependants in the case.

And the ancient and honorable W. U. looks down upon these juvenile combatants as calmly as the monkey who divided the cheese between the cats, in the old fable.

Another warning, relative to the danger of imperfectly installed underground conduits, is found in the accident to Mr. C. H. Summers, the electrician of the Western Union Company here, and Mr. Brotherhood, of New York, or as a daily here had it, Mr. Summers and a *brother hand*. These gentlemen were making an inspection of one of the company's underground conduits—which by the way is a gas pipe and Kerite wires—when the light, with which they were exploring the pipes near the man-hole, ignited the mixture of gas and atmospheric air, and both gentlemen were considerably burned by the explosion, and thrown backward to the ground. The injuries were painful, but not severe. Eyebrows and lashes, whiskers and hair were singed, and faces and hands more or less burned, but both will be around again, it is thought, in a few days.

The moral of this accident, which is only one of many of a similar character, here and elsewhere, show the positive necessity of an air-tight conduit, for all underground purposes, not only in electrical, but other subways, where inspection is occasionally necessary. Iron pipes do not hold gas perfectly, and this, once escaped, travels in the line of least resistance, permeating the soil throughout the neighborhood, and accumulates at the first convenient open space. Once there, mixed with the oxygen of the air, the compound is an extremely explosive one, and the merest spark sufficient to ignite the entire mass. In the case of a tube or conduit the whole forms a cannon, the dimensions of which would put even Krupp to the blush, and the unfortunate who fires the charge invariably stands at the muzzle, which is not the proper position for the gunner, according to all of the later works on ordnance practice and military discipline.

Brig.-Gen. Anson Stager, so well known in all electrical and military circles, died at his residence on the 25th inst. He was born in Ontario County, N. Y., in 1825. The son of an edge-tool maker at Rochester, at sixteen years of age, he entered a printing office as apprentice to that art. It is related of him that, while type setting on the Rochester daily *American* he was given an item on telegraphing, which he refused to set up, because "it was no 'count and could as well wait." His discharge was the result, and he drifted into the telegraph business from thence. In 1846 he was given his first telegraph office, under Henry O'Reilly, at Lancaster, Pa., on the line from Philadelphia to Harrisburg. He is credited with being the first to utilize one battery for several lines.

Subsequently to this, in 1852, Stager became general superintendent of the O'Reilly lines and the union of the New York State Printing Telegraph Company—House instruments—and the Atlantic, Lake and Mississippi Telegraph Company gave him still further domain to care for. He was a prominent factor in the subsequent formation of the Western Union Company, and was placed at its head as superintendent. He was the originator of the cunningly-devised contract which for so long gave the Western Union the iron-bound monopoly of rights of way over railroads.

At the opening of the Rebellion all Ohio, Indiana, and Illinois telegraph lines were placed under his charge as military superintendent of telegraphs. Subsequently he was with McClellan in the West Virginia campaign, where he conceived the first military telegraph cipher, which thoroughly defied the most expert detective work of the enemy in their attempts to discover the key. He followed McClellan to Washington, by order, and was commissioned, in 1861, as Captain and A. G. M., and appointed chief of the U. S. military telegraphs. Subsequently made Colonel and A. D. C., he remained in the service until September, 1865, when he was made, by brevet, Brigadier General, in recognition of valuable and meritorious services.

The consolidation of the Southwestern and American Companies with the Western Union required a reorganization of the latter, and the general superintendency of the whole was tendered the General. On his refusal of the position, three grand divisions of the company were made—the Central, Eastern and Southern—he accepting the general superintendency of the Central, with headquarters at Cleveland. In 1869 these were transferred to Chicago. This position, upon the resignation of General S., was given to Col. Clowry, who now holds it.

The General was for many years, until the commencement of the present, president of the Western Electric Company, and at the time of his decease was president of the Chicago Telephone Company, the Central Union Telephone Company, the American District Company here, and of the Western Edison Electric Light Company, of Chicago, and a director in the Northwestern National Bank of this city. He was a member of several social organizations, clubs, etc., and was vestryman of a prominent Episcopal Church on the South Side.

His wife, *nee* Miss Rebecca Sprague, whom he married in 1847, at Buffalo, died in 1883. Three of his children only are living—Mrs. F. S. Gorton, Mrs. Ralph W. Hicks, and Miss Ellen Sprague Stager. On Saturday last, the 28th, the remains were taken to Cleveland, where they will find their last resting place amid scenes where, the General often remarked, the pleasantest and happiest days of his life were spent.

Three of a kind—*The* Haskins, *The* Edison, and *The* Gilliland are wandering round among the fish, 'gators and stove-polished inhabitants of Florida, catching black bass and calling them trout, and in other ways following the ways of the Southern peoples. But oh, good Lord, deliver us! What must the fellow who rows their boat think, when those three rattling electricians get started, all at once, on ohms, amperes, volts and watts along in the middle of the day, when the biting is dull?

The Wisconsin Legislature is struggling with a tax bill to mulct the telephone company on their gross receipts of 1.5 per cent. or more, with no result up to date.

Chicago, 1885.

Following close upon the decision of the Court at Indianapolis, the United States Court at St. Louis has just rendered an important decision favorable to the Baltimore and Ohio Telegraph Company, in its application to the Bell Telephone Exchange at St. Louis for a connection to be used for the collection and delivery of telegrams over Baltimore and Ohio lines.

The case was argued before Judges Brewer and Treat. Judge Brewer, the circuit judge, grants the application of the telegraph company, and orders a mandamus issued compelling the telephone company to furnish the desired connection.

Judge Treat, the district judge, dissents, but, till overruled by the Supreme Court, the judgment of the Circuit Court controls the case.

NEW ORLEANS, LA., March 30, 1885.

The condemnation suit of the Baltimore and Ohio Telegraph Company *vs.* the New Orleans and North-Eastern Railway Company, covering the right of way on that road between New Orleans and Meridian, nearly 200 miles, and about 23 miles of the distance on the tressels on Lake Ponchartrain, has been decided in favor of the telegraph company, $5,000 damages being awarded to the railway company—the unusual amount being fixed on account of the use of the structure of the railway company over the lake.

This completes the right of way for the Baltimore and Ohio Telegraph Company to enable it to connect with Southern Telegraph Company's system at Meridian, Miss.

General Anson Stager died at Chicago, Ill., on Thursday of last week. He was born in 1825, and early in life became associated with Henry O'Reilly, who afterward became the pioneer in the building and operating of telegraphs. Stager took charge of the first office at Lancaster, Pa., on the line connecting Philadelphia and Harrisburg. To him is due the credit of first economizing batteries by charging many wires at the same time from the same source. He also connected long lines, and so saved time and risk of repetition of messages. In 1852 he was made general superintendent of the lines from Buffalo to Louisville, Ky. Soon after he became prominent in the organization of the Western Union system in the West and became its general superintendent. When Sumter was fired on, the governors of Ohio, Indiana and Illinois took possession of the wires in those States for military purposes, and at once put General Stager in charge of them as representing themselves. He accompanied General McClellan in his West Virginia campaign, during which he established the first system of field telegraphs used during the rebellion. When General McClellan was transferred to Washington he called Mr. Stager to that department to organize the military telegraph. This he accomplished. He invented the great system of cryptography used during the war. In 1861 he was made chief of the military telegraph throughout the country. At its close he was breveted a brigadier general for his services. For many years he has been superintendent of the central division of the Western Union, with headquarters at Chicago. Lately he has taken a prominent part in the introduction of the electric light. He founded the Western Electric Manufacturing Company, the largest manufactory of electrical machinery in the United States, and continued to be its president until Jan. 1 of the present year.

The "Novelties" Exhibition at Philadelphia.

The announcement of the Managers of the Franklin Institute of their intention to hold another exhibition in Philadelphia, during the autumn of the present year, will be news of interest to all our readers. The Electrical Exhibition of last year was an unqualified success in every way, and was most creditable to this useful and venerable institution, and to all who were concerned in it.

The managers have decided this year to hold an exhibition of a more popular character. It will be known as the "Novelties" Exhibition, and will be devoted, as its title indicates, to the display of such recent inventions, improvements and discoveries in the arts and manufactures, as may be deemed worthy of admission.

It will afford our inventors and manufacturers an excellent opportunity of bringing to public notice their best and most recent achievements. That the character of the forthcoming event will undoubtedly be maintained up to the highest standard of excellence, goes without saying, and our people may look forward to the "Novelties" as a rare source of interest and instruction.

From the announcement of the managers, the "Novelties" Exhibition will be opened on Tuesday, September 15th, and will be closed on Saturday, October 31st

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The constant extension of the Baltimore and Ohio system into the field of the Western Union has undoubtedly reached a point where it seriously affects the latter company. The wires of the Baltimore and Ohio now reach almost every important point, and the character of its service attracts a very large share of business. While the new line has to some extent taken the lead in the reduction of rates, open hostilities on an extended scale have not commenced. It is now considered probable that the Western Union will shortly inaugurate a war of extermination against its competitor, with the object of making the business so unprofitable that the Baltimore and Ohio will be forced to retire from it. This, however, those conversant with the affairs of the latter consider absurd.

Telephonic News

*** The Railway Telegraph Supply Company, Chicago, is doing a splendid business, Mr. Knapp, the general manager, having just placed some large orders with several leading railroads of the West. The trade in annunciators and bells was never better, and this company is well pleased with its continually-increasing business.

*** There is probably as much figuring among telephone superintendents over lightning arresters as over any other one thing. Two new ones are reported from Chicago, and, as good comes out of there quite often of late, it may be well to wait and hope.

*** There is again inquiry for telephone stock. A prominent firm of stock-brokers in Chicago were surprised to have a capitalist walk in and ask for 50 shares of stock in one Western company and 100 in another. The brokers have felt good ever since, and have received other similar calls, enough to make them believe money is coming out for investment once more.

*** The war in Europe, should it come off, may not displease American speculators, but it will make life a burden for the telegraph operators when the names of the Russian officers are strung along the cable wires. There will probably be "retardation" then—caused chiefly by the profanity of the receiving operator.

*** Judge Wallace issued a preliminary injunction, last week, restraining the Baxter Telephone and Telegraph Company, of Central New York, from conducting a telephone business. This is a sub-company of the Baxter-Overland doing business in Utica.

*** The net output of telephones by the Bell Co. for the month ended March 20 was 60, against a net of 3,252 last year, a net loss of 594 in February and 298 in January, this year. It is now thought that the company will obtain authority to increase its capital.

*** The following is a statement of the business of the New England Telephone and Telegraph Company for the month of January, 1885:

Gross receipts for the month.....		$75,362.19
Gross expenses	" "	53,769.68
Net earnings	" "	21,592.51
Construction	" "	12,715.77

*** Palmer—"Father, some one wants you at the telephone." Old gentleman (stepping up)—"Hello! Hello! Eh? Oh, yes; all right, of course. Good-by. (Turning to son.) Palmer, remind me to-morrow of what these people wanted." Palmer thinks the old gentleman has been dining with St. John. —*Life.*

*** The Inter-Continental Telephone Company is organized under the laws of the State New Jersey, and has acquired all the telephonic rights, franchises and property formerly owned by the Tropical American Telephone Company, limited, in Venezuela, United States of Colombia, Panama and Central America.

They purchase their instruments of the Tropical American Telephone Company at a nominal price, and thus secure entire ownership of rentals or royalty.

They have secured a concession from the Government of Venezuela, giving it the exclusive right to establish and maintain Telephonic lines and exchanges in and between the cities of Venezuela, and has already in full operation an exchange in the chief city, Caracas, with 475 paying subscribers. At La Guayra, the chief port of entry to the country, there is also an exchange with about 100 subscribers, and the two cities above named are connected by a trunk line with four wires, giving the subscribers of both places instant telephonic connection with each other.

There is also a similar system at Valencia and Porto Cabello, cities of next importance in Venezuela, with trunk line between them, and 150 subscribers are already secured at Valencia and 125 at Porto Cabello. It is proposed to establish similar systems at Maracaibo, Barquisimeto, Bolivar, Barcelona and the other cities of Venezuela wherever 50 or more subscribers can be secured.

The company has already expended over $75,000 in its plant and is beginning to receive fair returns on its investment. The receipts of the business in 1884 were over $25,000, and for 1885 are estimated at over $45,000.

In United States of Colombia a sub-contract has been made with the Colombia and Panama Telephone and Telegraph Company, which latter, organized under the laws of the State of New York, with a capital of $100,000, is doing the telephone business in Colombia and Panama.

Exchanges have been establish at Bogota, Barranquilla and Carthagena, and others will be commenced wherever a sufficient number of subscribers can be secured to support a central office.

In Central America a contract has been entered into with Messrs. Wendell & Phillips, of Boston, giving to them for a term of years, the exclusive right to export from the United States and sell, lease and use in that territory Bell and Blake telephones and transmitters.

Underground Wires.

At Harrisburg, Pa., the judiciary general committee of the Senate heard arguments on the underground bill last week.

Mr. Olmsted said, on this subject, that nobody denies that messages can be sent underground, but the best that science has been able to do in that direction is to make the underground system bear about the same relation to overhead lines that canals do to railroads. When the wires are under ground or near the ground, even if there be no actual contact, the electric fluid flows slowly, and so if the wires are in close proximity to each other, as required in underground cables. This difficulty is called *static induction.*

The sending of a telegraphic message is accomplished by the making of signals at one end of the line which are reproduced at the other end. The making of each signal at the distant end of the line requires the filling of the line with electricity and also its complete discharge. Where the line works perfectly this filling and discharge are instantaneous; where there is static induction it is retarded. Suppose that, instead of using electricity, it were attempted to force water through a pipe reaching from here to Philadelphia so as to work a piston which should produce the desired signals at that point, it being required to fill the pipe with water, and to accomplish its complete discharge to produce each signal. If, now, instead of water, it be attempted to use mucilage, which would undoubtedly stick to the sides of the pipe, the comparison would indicate, in some degree, the difference between the passage of the electric fluid through the wire overhead, and its passage through a wire underground or in proximity to other wires. Static induction, whatever its cause, stops the instantaneous passage of the electric fluid, causes it to stick apparently to the inner surface of the wires, and to work with great tardiness and irregularity. Static induction causes what is known by the term of retardation. It impairs what is described as the conductivity of the wires. In laying wires underground, it is necessary to lay them in cables, many conductors in each cable. Before they can be made to work successfully they must be insulated perfectly, not only from the earth but from each other. The best known methods of insulation are insufficient to entirely overcome the obstacle which I have mentioned.

He quoted from Sir William Thomson, the best English electrician, on this point, and also to show that by reason of this slowness of operation the appliance now used for sending four messages upon one wire—the Wheatstone system—would not operate successfully underground. The ocean cables would work under ground as well as under water, but they can send only fifteen words per minute; whereas, by the overhead lines, 250 words per minute are easily sent. During inauguration week the Western Union sent from Washington 817,276 words of press matter, and 60,668 private messages. This result was accomplished by the application of scientific methods of rapid telegraphy, which could not be applied where the whole or even part of the line is under ground. He showed that the only lines under ground in this country are for very short distances, and that if attached to long-distance aerial lines, although not quite, the effect was nearly as bad as if the entire line were under ground. He read a letter from Daniel Brooks, the head of the underground system, showing that in Europe the proportion of underground wires is very small, and that Antwerp, London and Brussels present but little better appearance than American cities, and that the overhead wires were increasing rather than diminishing there, and that in Antwerp, Brussels, Bruges, Ghent, Versailles and other cities telegraph companies have but one office in each city, and that at or near the railway stations.

Hon. William Henry Rawle sitting as master in the case of the Brush Electric Light Company, of Philadelphia, had heard volumes of testimony upon the subject, and recently decided that no underground system had yet been found to supersede the overhead wires. Upon this high authority he would learn the question of practicability. But even if practicable, the underground system is as expensive as to make telegraphy too costly for ordinary use. The insulation for underground wires costs for the best system $13,000, and by the cheapest, about $5,000 per mile, as against $600 per mile overhead. Of course the public would ultimately bear the increased cost. The cities alone would be benefited by the removal of the poles, but the country would have to bear its portion of the expense in the increased cost of messages. It will cost Harrisburg over $50,000 to put her fire alarm underground as required by the bill. Should a fault occur in a wire no man in the city could locate it, as an experienced man with a galvanometer is required to find the trouble when the wire is buried. In the meantime the entire city might be laid in ashes.

In Antwerp it was proposed to put up telegraph boxes like our letter boxes, from which messages will be taken up periodically and forwarded. How would such service suit the American people? We demand instantaneous service. Owing to the cheapness of extending overhead wires in cities, the Western Union has offices in nearly every hotel and upon nearly every corner. The convenience of offices and the use of call bells has greatly increased business. Increase of business brings cheaper rates. The average now is 40 cents for messages, as against $1.07 twenty years ago. Increase the price of building the telegraph, and you injuriously affect commerce and every business interest of the community. At $13,000 per mile, or even $5,000, no company could afford to have many offices in one city. Neither bankers, private individuals nor firms could afford to have private lines. Hotels could not afford offices. Political clubs could not have private wires to receive returns on election night. No company could afford to establish an office in the hall of a political convention, and no company could afford to dig up the earth to run a wire to connect with this chamber, as is now done, for the convenience of the legislature. The price of gathering the news for the daily papers would be greatly enhanced. In fact, every interest of the community would be injuriously affected by the increase of rates which would necessarily follow the passage of this bill.

THE BILL UNCONSTITUTIONAL.

The State has encouraged the erection of these very poles and wires by granting charters which every lawyer knows are contracts protected by the Federal Constitution. This had been repeatedly ruled since the famous Dartmouth College case, so that Judge Black had said the doctrine was sustained not by a current, but a torrent of authorities. This bill violates those charter contracts. Senator Hall asked if the State could not compel the removal of the poles in the exercise of the police power. Mr. Olmsted thought not. Mr. Rawle found that the poles were not nuisances. They had been erected by statutory authority, and with consent of councils. Under such circumstances, they could not be considered contrary to public policy. Their destruction would be a great deal more than a police regulation. It was a taking of private property by the public, and the Constitution of Pennsylvania, as well as the Constitution of the United States, requires that compensation must be made. Unless the bill makes provision for compensation, it is clearly unconstitutional.

This point which had not before been raised seemed to impress the constitutional lawyers upon the committee as of grave importance.

The speaker further continued that, as the bill placed obstructions in the way of the usefulness of the telegraph, it was a regulation of commerce forbidden by the Constitution, and a violation of the Act of Congress of 1886, under which the United States Government uses the Western Union as an agent, and daily operates 30,000 miles of its wires—part of them in this State. He read decisions of the Supreme Court of the United States in support of his position.

The court had held that Florida could not prevent the Western Union from erecting poles there, and that Texas could not enforce a law which increased the cost of the messages one cent. This bill would increase their cost far more than the Texas statute, and was more objectionable than that of Florida.

If this bill is enforced, the present telegraph system will go out of existence December 1, 1885. Suppose companies should not put down underground wires. You can lead the horse to water, but he may not drink. Companies may decline to invest in the hazardous and costly underground experiment. But if they should attempt in earnest to carry out this law, all the factories of any one underground system could not make cable enough to take their place, and if they were already made there are not in America enough skilled persons to make the necessary joints before December 1. If the companies do not take down their lines, the "local governments" are commanded to do so. Is the mayor to go about like a raging lion seeking what telegraph property he may devour, or is the chief of police the "local government" who is to ravish and destroy the handmaid of commerce?

If the bill is enforced, every telegraph officer, lineman, operator, messenger boys and probably attorneys would be fined and imprisoned. But they would have good company, as all the officers of cities would also be jailed unless municipal wires, fire alarms, etc., were also pulled down and put underground. The bill is absurd and impracticable, as well as unconstitutional.

In the present experimental state of underground telegraphy, it is too early to "call the previous question" about the overhead wires.

He read a strong letter from Dr. Norvin Green, deploring the bill as impracticable and unwise in policy.

Telephone Contracts.

A question of considerable importance to telephone users recently came up and was decided by the Supreme Court of Kentucky. The facts, as set forth in the reports, were that a contract was entered into in that State by telephone between Kuykendall, at Morgantown, and Sullivan, at Bowling Green. The former requested the operator to speak for him. Sullivan was called, and thereupon a conversation was held between him and the operator representing Kuykendall. An agreement was made, and Sullivan was sued for breach of it. He admitted holding the conversation by telephone, but contradicted the plaintiff as to what had been said. The operator at Morgantown was called as a witness to testify as to what communications he had sent and received, but, while he remembered that the conversation had been held, he had forgotten its particulars. The trial court then permitted Kuykendall to prove by himself and two other persons who were

present at the time what the Morgantown operator said to Sullivan and what he reported as coming from Sullivan.

The Supreme Court decides this to be competent evidence. It compares the operator to an interpreter. Where two persons communicate through an interpreter, the Court explains, the communication may be proved either by the interpreter or by persons who were present and heard the statements made by the interpreter. The interpreter is the agent of both parties. "It is true that in communicating by telephone the parties cannot see each other. But the statements of an interpreter between blind persons could be proved by third parties without calling the interpreter as a witness; and by telephonic means persons are as much together for all purposes of conversation, and actors in what may be occurring, as if they were immediately present with each other."

A COMPREHENSIVE SYSTEM OF TELEPHONE CIRCUITS IN THE PARIS SEWERS.

The wisdom of building sewers of such vast extent as those constructed in France's metropolis is once more being made manifest in a new way. The discussion which has raged in this country for some time back in regard to the removal of overhead wires, and putting them below ground has drawn atttention to the ease with which the Parisians have found a way out of the difficulty. There the wonderful network of sewers affords every facility for the passage of cables and other conduits.

When the telephone was first introduced in Paris, the small number of subscribers permitted the use of overhead lines; but, as the number increased, it soon became apparent that some other method of running them would have to be adopted, especially as many house owners demanded f. 500, and some even f. 1,000 a year for granting the privi lege of erecting a single bracket on the side of a chimney. Added to these persons were a number of others who withdrew their privileges on account of the humming noise produced by the swinging wires. The most natural way out of the difficulty, of course, was to run the wires through the sewers, and in 1880, upon the consolidation of the principal companies into a single one, bearing the name of "La Société Géneral des Telephones," this method was adopted. The city of Paris opened its sewers to the telephone company, in consideration of a rental, and the telephone wires found a resting place near the telegraph wires, which had already been placed there. The city let out a space 30 centimeters (about 12 inches) wide, and 10 centimeters (about 4 inches) thick along the vault of the sewer, which allowed the company to attach triple hooks on which 51 cables of 40 conductors each are hung. All telephone circuits in Paris are metallic, no ground returns being used, the object being to avoid induction. Consequently, every circuit requires two single conductors, and these are twisted together and covered with a layer of cotton of the same color. Seven such double wires, covered with different colored cotton, in order to distinguish them easily, are wrapped about with tarred tape and inclosed in a lead pipe. which is redrawn after the wires are inserted, in order to make a close-fitting covering. The multiple cables of 14 wires, constituting seven conductors, inclosed in lead, have an external diameter of 18 millimeters, and they are worth from f. 1 to f. 2 per meter, according to the current price of lead, copper and gutta percha. The length of the cable is about 400 meters, and it is only at the end of one of these sections that the individual circuits are soldered and led out into the buildings occupied by the subscribers. These single circuits are also covered with lead, and are carried in a small trench under the sidewalks into the respective buildings. These small cables are eight millimeters in diameter.

Cholera and the Underground Wires.

The *Philadelphia Times* says that the public has evidently been entirely at fault in charging that Cyrus W. Field and other telegraph magnates were opposing the movement to compel the wires to go under ground from pecuniary motives. The opposition to the execution of the New York law on this subject, and to the passage of a similar law in Pennsylvania, it now appears, has been inspired by the purest motives that could spring from the stockholding heart. It is the public that is to be saved from a dire calamity by the reluctance of these electric rulers to obey the mandate of the law.

Instead of caring a cent for the pecuniary loss which would be entailed upon the telegraph companies if they buried their wires, it appears that they would freely pay the money necessary if the performance of the work did not involve the community in a great peril. Mr. Field has confided to the New York public his solemn conviction that burying the wires in that city during the coming summer would be sure to cause a fatal outbreak of cholera. According to his theory, the soil beneath all city streets is fairly saturated with cholera germs, which only wait exposure to the sun and air by the shovels of the wire-burying brigade to seize upon the bowels of the unsuspecting passers-by and convert them into cold corpses at a rate that would make all other forms of disease turn green with envy. His advice is that the streets be kept intact, and that the people pass along them with hushed voices and bated breath, in the hope that the cholera won't find out they are about, and will consent to remain in its underground retreat, along with the high-priced gas and foul water contained in the mains laid down years ago.

Telegraph Company Stipulation in Contracts.

In a recent case, where it appeared that one of the printed blank forms in use by a telegraph company contained the following condition, "No claim for damages shall be valid unless presented in writing within thirty days after sending the message," and beneath the blank space for the message and place of signature was printed in large type, "Read the notice and agreement at the top," the Supreme Court of Minnesota held that one who filled up and signed a message upon such blank form was presumed to have had notice of such condition, and was bound by it as a part of his contract with the company, and that the stipulation therein contained was reasonable and not contrary to public policy. Cole *vs* Western Union Telegraph Company, decided February 14. The court said: "It cannot be contended that a regulation requiring the sender of a message to present his claim for damages in writing promptly to the company is an unreasonable one. Considering the character of its business, such regulations would be necessary for its own protection and to enable it reasonably to ascertain the facts in the case and to secure or preserve the proper evidence. It is not a regulation intended to shield the company from the consequences of a neglect of duty on its part, but prescribing a duty to be performed by the plaintiff before he should be entitled to maintain his action."

Telegraph Blunders.

It has been judicially decided in several States that a telegraph company is not liable for the damages caused by the blunders of its operators when the sender does not have the message repeated in accordance with the conditions printed on the blank. In other States the company has been held liable. In an opinion just reported the California supreme court adopts the latter doctrine declaring that it is "based on the better reason."

The plaintiff had written this cipher message: "Buy bail barley falum." As telegraphed it read: "Buy bain barley falum." The meaning of the first way, buy one hundred tons of barley. The translation of the second was, buy 250 tons of barley. The receiver bought the larger amount. The sender thereby incurred a loss of $500, for which he sued the Western Union.

The company showed that the message had been written on a blank exempting it from liability for mistakes unless the sender should have the message repeated. This message had not been repeated.

The California Supreme Court holds that a "telegraph company cannot legally stipulate against or limit its liability or mistakes happening in consequence of its own fault, such as a want of proper skill or ordinary care on the part of the operators, or the use of defective instruments." It is no defense for the company to say that the message was in cipher and that the operator could not know what it meant. "The operator may reject a message that is illegibly written; but if the words, whether cipher or not, are plainly written, it is his duty to send the dispatch as written. Why has he a right to know what the message refers to? In what way should such knowledge aid him in the discharge of the duty to send it correctly?"

The court further holds that the plaintiff makes out a *prima facie* case by simply showing that the error was committed. The company must then prove, if it can, that the blunder was not due to the negligence of its operator, but to some cause beyond its control.

This decision settles the question in California. In some other States the law has been construed in favor of the company.

*** Recent experiments in long distance telephony have been carried out in the Argentine Republic, the system being that of Van Rysselberghe. After the first few trials in Buenos Ayres itself, conversation was successfully maintained between Buenos Ayres and Belgramo, a distance of 22 kilometers (13.6 miles); between Buenos Ayres and La Plata, 70 kilometers (43.4 miles); and between Buenos Ayres and Rosario, 1,350 kilometers (837 miles). These experiments, which were coincident with the *fetes* of the foundation of the Republic of La Plata, have given most excellent results.

.... Quite a serious accident occurred last Friday at Chicago in the Western Union Telegraph building. A. Brotherhood, engineer of the company in New York, and C. H. Summers, the electrician, were making preparations for drawing the wires through the new conduit. The two men entered the tunnel for the purpose of making an examination. The flame of their lamp caused an explosion of gas which had escaped from the mains. Mr. Brotherhood was blown from the tunnel, and was burned about the face and hands Mr. Summers received the full force of the explosion, and was more severely burned. The doctor said both would be out in the course of a week or ten days.

.... Telegraph operators now-a-days are inclined to be skeptical as to the amount of work that telegraphers are able to perform, and the ancient stories of great work done by "old timers" are received with outspoken incredulity. Yet there are undoubted instances of almost marvelous performances by operators of skill. The recent inauguration of President Cleveland, attended as it was by a great rush of news dispatches from the capital, furnished an opportunity for a somewhat remarkable day's work by the Associated Press operators on the leased wire between New York and Boston. The news began to come at 9 A. M., and, before the afternoon papers in Boston had gone to press, 12,300 words had been received. The actual time involved in the transmission of this matter was less than six hours, making a very high average for the number of words sent for each hour and minute during that time. In Boston, the veteran operator, William E. Kettles, who was distinguished as a telegrapher during the war, received this report upon manifold, of which ten copies were simultaneously taken. There are but few, if any, records of telegraphic work that surpass, or even equal, this performance. The endurance of Mr. Kettles is regarded as phenomenal, even among those who are inclined to be most credulous. For more than twenty years he has been employed in the most arduous branches of the service, and his work is still as clear and skillful as that which gave him his widespread reputation as an expert many years ago.

.... The Baltimore & Ohio Telegraph Company last week opened an office in New Orleans. This is the first telegraph opposition in this city in many years.

TELEGRAPHIC

.... It is worth noting that the Boston telegraphers in the Bankers and Merchants' office say they only struck "for the purpose of lending support to their New York brethren." It shows how carefully labor is organizing throughout the country to protect itself against capital.

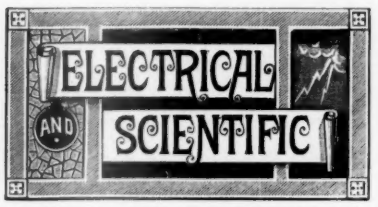
.... A French officer of engineers has conceived an idea for enabling vessels on the high seas to communicate with the shore by means of the existing submarine cables. He proposes that these cables shall be supplied at convenient intervals with short branches, the free ends of which shall be buoyed in such a manner that passing vessels, provided with the necessary batteries and with a key by which to obtain access to the wires, may telegraph home. Experiments to test the feasibility of the scheme are about to be begun, and several branches are being attached to the cable which connects Algiers with Marseilles.

.... Speaking of telegraph operators," said a gentleman recently, "there's 'Cap.' Thomas, the night operator for the Associated press. His record has never been beaten in Boston. On Friday night, June 6, 1884, the night Cleveland was nominated at the Chicago Convention, he took 14,325 words between 7 P. M. and 2 30 A. M., and made eight or nine manifold copies of the matter. How much would that make?

"Oh, 6¼ columns of solid nonpareil type, in round numbers."

"Well, then, that's at the rate of 2,000 words an hour or 33 words a minute, without allowing any time for break. His total for the seven days of that week was 69,783 words—a big week's work now I tell you. On Sunday, March 8, he amused himself by taking 9,221 words in five hours. Now, a man who writes two columns of nonpareil matter in a night with a smoothly-gliding pen thinks he has done enough for a good day's work, but Thomas, mind you, has to write with a stylus on manifold paper and exert a great deal of force to make the impression."

.... Some curious tales have been told of telegraphic blunders, and some amusing instances have been quoted of the peculiar ideas entertained by non-technical people as to the nature and capabilities of electricity and electrical apparatus. It is scarcely fair, perhaps, for us to tell tales out of school, but the following anecdotes, as illustrating some of the abstruse speculations into which it is possible for the human mind to enter, are too good to be withheld: Some time ago at the —— —— station of one of the cable companies, an operator who had charge of a Morse circuit, found that something had gone wrong; what, he knew not, but something. He examined the relay; coils still there! The instrument; nothing perceptible! Ink; *that* was all right. Despair! Ha! the batteries. Some hours afterwards the following note was to be seen on the office diary: "Signals failing; on examining batteries found nearly all the zincs *eaten away by the pots!*" The cells were Daniell's with earthenware outer jars. At another station we heard of an individual whose intelligence was almost equally brilliant. There was, it appears, a partial fault in one of the cables and from time to time the condensers were short-circuited and a powerful copper current put to line for a few moments to seal the fault. X noticed this being done, and his able mind grasped the details in an instant. During the night he short-circuited the condensers, but magnanimously forbore to worry the cable by administering the electrical dose of copper. That being so, it was unreasonable in him to officially criticise the action of the "copper-box" so unkindly. Both these men had been engaged in telegraphy for ten years or so.—*London Electrician.*



* * There are 3,985 paper mills in the world, in which 1,904,000,000 pounds of paper are annually manufactured. Half of this paper is used for printing, 600,000,000 pounds only for newspapers, the consumption of which has risen by 200,000,000 pounds during the last ten years. As to the use of paper by individuals, an average of 11½ pounds is used by an Englishman, 10½ pounds by an American, 8 pounds by a German, 7½ pounds by a Frenchman, 3½ pounds by an Italian or Austrian, 1½ pounds by a Spaniard, 1 pound by a Russian, and 2 pounds by a Mexican.

* * Advices from Brussels state that the Compagnie Belge et Hollandaise d'Electricite has at length overcome all obstacles connected with the electrical working of the Rue de la Loi Tramway, Brussels. The Faure accumulators, 48 in number and with 820 kilogrammes, or rather over 16 cwt., of lead and oxide, giving out a useful effect of 66 per cent., are charged by dynamos put down for the purpose. The line, about a mile long and with heavy gradients, has hitherto been worked by horses; but it is found that a saving of 30 per cent. is effected by electrical working.

* * It is claimed that a Skrivanow battery, contained in two small boxes, 10 inches long, 8 inches wide and 6 inches high, consists of a number of cells, only an inch in width, in which zinc plates and chloride of silver are placed in certain proportions, with a weak solution of potash as the excitant, is sufficient for an arc lamp of 600 candles nominal, or for 75 small incandescent lamps. Local authorities contemplating a great expenditure upon gas-works, with all the inconvenience and perpetual annual cost, will do well to pause and consider what is being done elsewhere to provide at far less than the cost of gas a more brilliant and beautiful illuminant.

* * Machinery belts ought thus to be treated, according to a trade journal: When a belt has been slightly injured by rain or by being wet in any other manner, it should be dried as much as possible, and laps that have started out to be fastened by a little cement. A good cement for this purpose is made of equal parts of good glue and Russian gelatine dissolved in water and cooked in a tin vessel, constructed like an ordinary glue pot until the mass is thick and ropy. The cement can be worked into the places which require to be united by means of a knife. Then the belt should be hammered until dry. A few wooden pegs, such as are used by shoemakers, may be driven in. The pegs must be cut off a little from the surface on the reverse side, and hammered well down on a flat iron, lapstone or anvil.

* * Everything on the earth and in the air above is permeated with the earth's magnetic force—it goes through your clothes, it penetrates your bodies, it saturates your brain—it is part of life itself. Gaus, the illustrious German astronomer, has computed (taking as a unit of his measure a magnet 14 inches long, one inch wide, one-fourth inch thick, weighing one pound, made of the hardest steel and of the strongest magnetic force possible) the earth's magnetic force as equal to 8,464,000,000,000,000,000,000 such magnets. The attracting or lifting power of such a magnet is about ten pounds, which would make the attractive power of the earth 42,310,000,000,000,000,000 tons. If this magnetism were equally distributed throughout the mass of the earth, the magnetic intensity of each cubic yard would be equal to six of these magnets, or about 60 pounds attractive force. Professor Mayer has shown that this magnetic influence, this invisible force, is a power filling space to an unknown distance, and radiating in the lines of magnetic force very much as the rays of the sunlight, the lines of the earth's magnetic force being from south to north, as indicated by the compass needle.—*Horological News.*

* * M. Tresca's experiments on the transfer of energy by electricity are regarded by scientific specialists in this line as of great value. It is admitted, in fact, that, even if a quarter of the original energy could be transmitted, there would be many cases in which a force could be transmitted to a distance which it would be impossible to produce at the place where it is used. The delivery would, of course, vary largely under varying conditions.

* * By means of electricity the most attractive surfaces are now completely imitated. The leather which it is desired to imitate is first well cleaned and coated with graphite, as in electro-plating a smaller article. It is then placed in a copper bath, the tank of which is large enough to easily receive a skin of any size. A dynamo-electric machine generating a powerful current furnishes the electricity. The copper is deposited upon the coated surface of the hide to a thickness of one-sixteenth to one-eighth of an inch. The plate thus formed reproduces, but reversed, every mark and minute vein of the leather, so that a print taken from it is an exact copy of the original in every detail.

* * A description of a new photometer has recently been laid before the Societe Belge d'Electriciens by M. Wybauw. The white light of the electric arc lamps has hitherto presented great difficulties in the calculation of the candle-power of such lights. The photometers commonly used give erroneous results, in that the arc lamps of 5,000, 10,000 and 20,000 candle-power, according to the manufacturers' value, are not seldom found to be considerably below those figures. By the method of M. Wybauw the difficulties presented by the difference of flame and arc color are surmounted, and by a calculation of a somewhat complicated nature the measurement may be made with mathematical exactitude.

* * Dr. Gore, F.R.S., has been making a large number of experiments on the deposition of carbon, boron and silicon by means of the electric current. Most of these experiments resulted in failure, or comparative failure, to deposit carbon, but several were successful. For example, he succeeded by electrolyzing in a platinum cup a fused mixture of 475.2 grains of 97.1 per cent. of sodic carbonate, and 217.4 grains of boro-fluoride of sodium. A sheet platinum anode and a thick platinum wire cathode were used. A black deposit of carbon, nearly pure, was formed on the platinum wire, and gas was given off at the anode. The current was supplied by ten Smee elements. With the same current he also electrolyzed in a platinum cup a fused mixture of 300 grains of 97.1 per cent. pure potassic carbonate, and 442 grains of silico-fluoride of potassium, using similar electrodes. Gas rose from the anode, and at first gas only rose from the cathode too. After that streams of black matter poured down from the cathode, and the latter acquired a blackish film, but subsequently became alloyed and fused on the surface. The deposit was, therefore, partly or wholly silicon. Again, a fused mixture of 200 grains of pure sodic hydrate, 170 grains of pure precipitated silica, and 610 grains of the mixed anhydrous carbonates of potassium and sodium, were electrolyzed by a similar current employing similar electrodes Much oxygen, re-lighting a red-hot splint, was given off at the anode. Dark streams flowed from the cathode, sodium was set free, and, if the cathode was only slightly immersed, bubbles of sodium vapor were emitted and took fire at the surface of the liquid. After one hour's action the platinum anode had lost 0.37 grains in weight, and the cathode had a jet black deposit on it. This deposit was subsequently washed and dried; a portion of it burned with a glow when heated to redness on platinum, and left a minute residue of grey platinum. It also deflagrated with fused niter below red heat, and vividly by heating with potassic chlorate. It did not dissolve nor evolve any gas in a mixture of strong nitric acid and pure concentrated hydrofluoric acid. It was, therefore, not silicon, but carbon containing a minute quantity of platinum.

President Cleveland Does Away with an Old Custom.

It has always been the custom to summon attendants from one portion of the White House to another by the clapping of hands, after the manner of the Orientals. This was rendered necessary by the absence of the familiar electric bells, particularly connecting the private part of the house with the offices. The custom has often led to confusion. President Arthur would stand in the middle of the Blue Room, and by clapping his hands he would summon attendants from every direction. It is understood that during the first visit of President Cleveland to the White House, Mr. Arthur explained to him the custom referred to. While appreciating its oddity, the new President evidently thought it could be improved upon

The President has engaged the firm of Royce & Marean, manufacturers and dealers in electrical apparatus, to put in a complete system of annunciators and electric bells throughout the building, and the hand clapping will soon be a thing of the past.

These enterprising young men are the sole agents in Washington of W. F. Gardner's system of correcting ordinary clocks, by electricity, thereby always controlling the standard time. The basis of the system is that an astronomical observatory—such as the United States Naval Observatory, Washington, D. C—ascertains and sends out the standard time by electric signal, at stated periods, and may control any number of clocks within reach of the electric signal. This system is in use at the Washburn Observatory, Madison, Wis., and the James Lick Observatory at San Jose, Cal. They are also agents for the Western Electric Company of Chicago, New York, and Boston, the same being the largest manufacturers of electric apparatus in the world.

Every line of telegraphic, telephonic and general electrical supplies known to these our modern days, are represented by this house. Contracts are taken and estimates given for fitting up private residences, hotels or public buildings with electrical apparatus of every description.

Experiments in Magnetism.

Professor J. A Ewing, of University College, Dundee, has communicated a paper to the Royal Society, which contains several points of immediate practical importance. He finds, for example, that the "dissipation of energy" by reversal of magnetism is very much smaller in soft iron than in hard iron or steel, and even in the latter its amount is trifling, so that the principal part of the heat which is produced in the cores of electro-magnets must be due chiefly to other causes than the "static hysteresis" or static lagging action observed by Professor Ewing, and is, in fact, due almost wholly to the induction of so-called Foucault currents in the cores. This was a point requiring elucidation, and is of practical value in the construction of dynamos, so as to prevent heating due to the reversals of the magnetism. Professor Ewing has also found that by vibrating a piece of soft iron during the application and removal of magnetizing force, the effects of hysteresis or static lagging are almost entirely removed, and the iron is then found to possess almost no retentiveness. But when the application and removal of magnetizing force are effected without mechanical disturbance, the retentiveness of soft iron is found to be even greater than that of steel. In some cases 93 per cent. of the whole induced magnetism of a piece of annealed iron was found to remain on the complete removal of the magnetizing force. It is pointed out that there is no discrepancy between this result and the well-known fact that a short iron core of an electro-magnet retains almost no magnetism when the current in the magnet is interrupted. In this case the ends of the magnet itself, after interruption of the current, exert a sufficiently reversed magnetizing force to almost entirely destroy the residual magnetism. But when tested under the conditions which give uniform magnetization, and avoid the demagnetizing influence of the ends, soft annealed iron is more retentive than even the hardest steel. Examples are also given by the author which show that the influence of permanent set in the curve of magnetism is so marked as to give a criterion by which a strained piece may be readily distinguished from an annealed piece of metal, and that strain diminishes very greatly the magnetic retentiveness of iron. The effects of strain and temperature on different specimens of magnetized iron and steel are also discussed by Prof. Ewing, the results being for the most part presented graphically.—*London Engineering.*

JACKSONVILLE, Fla., March 24, 1885.

Editors Electrical Review:

SIR,—In the ELECTRICAL REVIEW of the 14th inst., I observed some remarks respecting the "electric light and the eyes," which also contained the opinion of an oculist upon its effects upon the vision.

I will give you my experience, and also my candid belief upon the matter, though I cannot speak with the gravity of a professional oculist; yet I can give my testimony with the sincerity of a careful observer.

I have long suffered from defective sight, induced, I presume, from much reading and working by gas and lamp light. Glasses have become a permanent necessity. Lately I have been thrown where I could enjoy the privilege of reading by an electric arc light. At first I was prejudiced, imagining that the glare and brilliancy of the light would prove detrimental to the eyes. My astonishment is not easily described, when I discovered, that by the aid of electrical illumination I could read without spectacles I am certain that it does not weary the eyes. Indeed I believe that my vision is slightly strengthened by its use. I have conversed with others who have opportunities of noting the influence of the light upon the optic nerves, and the general opinion is that no injurious effects result from its use to the eyesight.

Upon this, as upon any other subject, it is well to be candid and outspoken. Truth must eventually prevail, and whatever preconceived ideas we may form concerning any new phenomena, time and experience alone will decide. It does seem to me, that the better acquainted people become with the electric light, the more will they appreciate its merits, and desire its general application.

A Rhythmic Electric Bell.

In order to distinguish one bell from another, it is better to give them different rhythms than different tones, because few ears are able to distinguish more than three different tones. M. Von Hefner-Alteneck has constructed an electric bell with an automatic device for regulating the rhythm of the stroke. It consists of the ordinary electric bell arrangement, namely, electro-magnet, armature and contact screw. The stem, which carries the clapper at its end, is made longer than usual, and about midway down its length it carries an arm or pawl projecting from it at right angles, and catching in the teeth of a small toothed wheel revolving in the vertical plane of the stem and pawl. This wheel is fixed concentrically with a second wheel or cam, so that both turn together, and the teeth or projections of the cam are so formed as to catch a second projecting arm lower down on the stem, and shorter in length than the pawl above it. When this latter arm encounters a tooth of the cam, it is thrust from the cam, thereby causing the stem to bend or swing back, and in the recoil the clapper beats once on the bell. Thus the order of the strokes is governed by the way in which the periphery of the cam is cut into narrow or wide teeth, and a great variety of rhythms can thus be obtained, even from the same bell, by changing the cam.

In the new Board of Trade building Chicago, which will be ready for occupancy May 1st, the accommodations for the telegraphic fraternity are not just what the boys would prefer. The plan now being arranged is to keep all the operators off of the floor and inclose them in one big circular "cowal," with partitions separating the different com-

panies. The managers of the Board are about equally divided as to whether this will be an improvement or not, and the manipulators of the key are confident that it will slow up the business of sending messages very materially. What is known as "straddling the market," which a half minute makes or loses the deal, is thought to be impracticable with this arrangement. The Western Union has had a very elaborate system of tubing done for them between the new Board of Trade building and their main office some five blocks north on La Salle Street. The tubes are from two to three inches in diameter, and will carry the messages, by means of air pressure, back and forth at such speed and in such quantity as will equal any demand that will likely be made on them.

Another New Electrical Wonder.

The possibilities of electricity are not only not exhausted, but even those specialists who have devoted the best efforts of a lifetime to its study, have not yet commenced to realize the full extent of the uses to which it may be applied.

New applications of this wonderful power are announced to the world, almost day by day, and each announcement seems to excel the other in improbability. The seemingly wildest vagaries in this direction, however, find their realization in course of time. One of the most recent and most startling inventions is that of DeGuidrab, of Victoria, who claims to have so far perfected an instrument called the electroscope, as to be able to transmit, by electricity, vibrations of light, and to thereby reproduce scenes to the eye from a distance many times beyond the range of human vision. According to the London papers, a trial of this instrument took place at Melbourne, in the presence of scientific and public men :

"Sitting in a dark room they saw, projected on a large disk of white burnished metal, the race course at Flemington, with its myriad of active beings. Minute details stood out with perfect fidelity to the original, and as they looked at the wonderful picture through binocular glasses, it was difficult to imagine that they were not actually on the course itself, and moving among those actions they could so completely scan."

It is to be hoped that this wonderful invention will be exhibited to the general public the coming summer, in order that its capabilities may be made widely known and its benefits promptly reaped.

The idea of telegraphing from ships at sea is not a new one, and crops up from time to time. Mid-ocean telegraphic stations have been proposed, and will probably be carried out some day. The chief difficulty in the way of their adoption has hitherto been the necessity of keeping the ship connected by a branch cable to the main cable lying at the bottom, and anchoring her so to maintain this communication in all weathers and depths desirable.

Prof. A. E. Dolbear has proposed a plan which may render this fixed communication unnecessary. A large metal plate attached to an insulated conductor is lowered from the ship to the bottom on the track of the cable, and another plate is merely submerged. Between these two plates a battery and Morse key are inserted. On working the key the Morse currents induce other currents in the cable, which can be heard in telephones attached to the cable on shore.

It seemed when the magnetic telegraph enabled men to communicate instantly, though scores of miles apart, that no more could be added to that achievement. But they already hear each other's voices through the telephone, now they are to see each other with the electroscope, and this is not the end.

The above claims are, so far as the electroscope is concerned, very far from the practical stage as yet.

Trials of Zirconia for Use in Electric Lights.

As the magnesia combs of Mr. Fahnehjelm are now attracting much attention for the utilization of water-gas in illumination, the following results of independent trials of zirconia for use in the electric light will be of interest. A number of trials were made, and though the results were not satisfactory as to its applicability for this use, they are interesting as showing its behavior in the electric current, and when subjected to the voltaic arc.

It was represented that zirconia, when made into a pencil with a certain admixture of carbon, would become incandescent, and would give out a brilliant, steady, and white light. Messrs. Torrey & Eaton were consulted, and they manufactured the zirconia and pencils, and directed the tests.

A number of pencils were made, cylindrical in shape, of one quarter inch diameter, and one inch in length. Pure zirconia was used for some pencils, and others were made according to the formulæ given: Zirconia, one part, and carbon five parts; zirconia, one part, and carbon seven parts; others, with but little carbon in the middle, and gradually increasing the amount until the ends were almost pure carbon. These were supported between brass holders (brass tubes sawn longitudinally and opened slightly), which were clamped in the carbon-holders of an arc light. Disconnection was made so that the current exerted no force on the positive holder, and it was supported so that its weight might not be borne by the pencil.

Some difficulty was experienced in fastening the pencils in the holders, as they would crumble when any force was used to push them in. They finally were rested between the holders, while the upper rod was fastened as remarked above. In the same circuit and near the lamp in which the trials were made, were three arc lights, in order that the value of the pencils, as light-producers, might be approximated without the use of the photometer. Those pencils containing carbon were tried first, and as the results were nearly uniform in all the trials, one description will suffice. The current strength was increased gradually, and was measured by an ammeter in circuit.

At first, a few sparks were seen at the holders, with a current strength of 15 amperes, which were quickly obscured by a reddish flame that enveloped the pencil, due probably to the combustion of the carbon at or near its surface. The flame subsided, and brilliant sparks were shot out, lasting for about two minutes, when the flame ceased entirely. The pencil was now seen to be red-hot, and seamed and porous, the current strength at this time having been increased to 20 amperes. As it held this red heat without giving out light for several minutes, the strength was increased gradually to 40 amperes, with no result other than that it fell away and crumbled, until it dropped out of the holders. It was found, after the first trial, that the brass holders had been fused at the point of contact with the pencils. Platinum holders were then tried with similar results. When the current was first passed, a succession of sparks was seen at the junction of the pencil with the platinum, before the pencils flamed. A pure zirconia pencil was tried between these latter; but a current strength of 40 amperes could not be passed, and no greater was tried. In order to subject them, if possible, a longer time to the action of the current, two holes were drilled longitudinally in two copper-plated carbon pencils, and the zirconia pencils were held between them. But the results were the same: they crumbled and fell away, showing that this falling out was not entirely due to the fusing of the holders, as might have been supposed in the other cases. A final trial was made of a pure zirconia pencil, which was recessed so deeply as only to leave about an eighth of an inch between the carbons, and the arc was established. No greater light was given than in the neighboring arc lights, and subsequent examination showed the zirconia to be fused to a hard white enamel. In some of the first trials, two zirconia and carbon pencils were placed in contact, and it was found that they stuck slightly together. Not much importance, however, was attached to this, as it was thought that it might be due to some foreign substance between them, or to some impurities of the carbon mixed with them. But this last proved beyond a doubt its ultimate fusibility.

Talc was tried, after cutting it to the required shape and thoroughly baking it in a muffle. No current could be passed—that is, current of 40 amperes strength—and in presence of the arc it fused rapidly.—*Engineering and Mining Journal.*

Honoring the Dead.

A LARGE CONCOURSE OF REPRESENTATIVE CITIZENS ATTEND THE OBSEQUIES OF GEN. STAGER.

The funeral service over the body of the late Gen. Anson Stager occurred at the family residence, 1735 Michigan Ave., last Saturday. The obsequies were attended by a large number of friends of the deceased, and the board of directors of the Chicago Telephone and Central Telephone Companies in a body. Many magnificent floral designs were sent in during the day, in token of respect to the memory of the dead electrician. The most noticeable among them was one from the employes of the Western Edison Light Company, consisting of a bank of roses, from the center of which rose a mast having stringers of smilox running from the top to the corners of the base. At intervals on the smilax were hung bunches of violets, representing electric lamps. A superb cross and anchor composed of the choicest flowers, was contributed by the telephone company, and numerous individual floral mementoes gave evidence of the regret felt by friends at their loss.

The ceremony was conducted by the Rev. Mr. Osborne, of Trinity Episcopal Church, who read the burial service of the church in an impressive manner. The pall bearers were Marshall Field, John De Koven, J. Russell Jones, A. F. Leeberger, George Sturgis, Robert Lincoln, A. A. Sprague, Martin Ryerson, N. K. Fairbank, Norman Williams, and J. W. Doane. The casket was borne by the superintendents of the corporations of which Gen. Stager was president. The remains were taken to Cleveland, O., for interment, leaving on a special train over the Lake Shore & Michigan Southern Railroad at 5 o'clock, escorted by the pall bearers and numerous friends.

The Mayor, desiring to show respect to the memory of the late Gen. Stager, ordered all the fire alarm bells to be tolled during the passage of the funeral cortege from the house to the Lake Shore & Michigan Southern Railroad depot, in token of the appreciation and interest shown by the deceased in promoting the efficiency of the fire alarm telegraph system.

An Experimental Road to be Put in Operation in San Francisco.

Within a month it is believed the Pacific Coast Electric Construction Company will have an experimental electric road running from the Southern Pacific Depot to the Union Iron Works at the Protrero, in San Francisco, Cal. For some time past experiments have been made in this direction, and the plans are now said to be complete. The road will be similar to the cable road, only, instead of a cable underneath the track, there will be a negative and positive wire. These, when brought together by the grip of the dummy, will complete the circuit and provide the motive power. When the car stops the wires will be released; thus the power necessary to drive the car will be saved while it is at rest. The generating machines are also so arranged that as soon as a car stops they will cease to generate the amount of electricity to propel the car. Should the line become blocked by a procession, or other cause, this plan will result in a great saving. There is said to be no limit to the pace at which cars can be run by electricity, and experiments on the electric roads at present existing show that to propel a car conveying 44 passengers costs only from four to 5 cents for each mile traveled. Should the experimental line prove a success, electricity as a motive power will, no doubt, be adopted on many of the street railroad lines there.

ELECTRIC LIGHT NEWS

—— The Worcester, Mass., Electric Light Company declared a quarterly dividend of 3 per cent. last week.

—— In Paris it has been carefully determined that the cost of gas-lighting, as compared with that of lighting by means of electricity, is as 431 to 344, in favor of the latter.

—— The streets of Chillicothe, Ohio, are to be lighted with arc lights. A 100-light plant supplied by the Brush Electric Company, is in process of erection.

—— The Thomson-Houston Electric Light Company have just made all the arrangements for putting a plant in at Newport, R. I. They will do all the city lighting in addition to a large amount of commercial lighting.

—— The Callender Insulating and Waterproofing Company have moved their offices to the Mills Building, 35 Wall Street, New York. This company is now running their works at Newark to their fullest capacity.

—— We understand that the Lewiston and Auburn Electric Light Company (Maine), and the Menelota Electric Light Company (Illinois) both using the Thomson-Houston system, are declaring dividends to their stockholders.

—— The Brush Electric Light Company, of Erie, Pa., lately made a contract for lighting a liberal section of Erie. Although but lately organized, the company promises, with this contract, to do exceedingly well, even in its early years.

—— The dust has cleared away at Lockport, N. Y, where the local gas company contended with a new electric light company for the privilege of supplying electric lights. An arc light plant, Brush system, of sixty-five lights, is in operation.

—— We are informed that Mr. C C. Cooper, President of the Municipal Electric Light Company, of Brooklyn, has returned from Florida, where he recently made quite a reputation as a marksman, evidence of which he exhibits in his office in shape of seven large alligator hides.

—— Mr. T. H. Smith, an enterprising citizen of Jamestown, N. Y., after using the Brush electric light successfully in his cotton mills for some years, began the furnishing of lights to stores. His efforts have been thoroughly satisfactory, and the people of Jamestown are greatly delighted with the growing enterprise.

—— The Thomson-Houston Electric Company have put in operation through their Chicago agency, since January 1st, the following arc-light plants: Atchison, Kansas, 45 lights, afterwards increased to 75; Janesville, Wis., 50 lights; Pontiac, Ill., 27 lights; Freeport, Ill., 30 lights, afterwards increased to 60; Streator, Ill., 25 lights; Racine, Wis., 100 lights. Blomgren Bros., Chicago, have in successful operation a special Thomson-Houston light for photographing purposes. The 50-light plants, each at Terre Haute, Indiana, and Oshkosh, Wis., will be in operation in 30 days. The Chicago Agency is well pleased with the business outlook for their system in the West.

—— The new electric light station of the Brush Company, near the Providence Railroad station, is being rapidly completed. Two of the new Armington & Sims engines have been received, and will be put in position this week. Three new steel tubular boilers, built by the Cunningham Iron Works, of Charlestown, have been received, and will be set with the Jarvis patent boiler setting and Sheffield grate bars, to use coal screenings for fuel. The capacity of this station for the present will be 750 horse-power, but there is room for future enlargement, and the chimney has been made large enough for 1,500 horse-power. It is 140 feet high, and the diameter at the base is 7 feet.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 24, 1885.

314,242 Armature for Dynamo-Electric Machines; C. L. Healy, Brooklyn, assignor to Stephen D. Field, Yonkers, N. Y.

314,277 Means for Generating Steam by Electricity; Walter W. Vaughn and Edward D. Eldridge, Stockton, Cal., assignors to themselves, W. W. Paddock, Henry W. Devoll, Edward Elmore Eldridge, Charles A. Eldridge, Joshua B. Webster and Asa Clark.

314,292 Electric Signaling apparatus; F. Benedict Herzog, New York, N. Y.

314,293 Method of Latent Signal Transmission, F. B. Herzog, New York, N. Y.

314,294 Circuit Changer for Latent Signal Transmission; F. B Herzog, New York, N. Y.

314,304 Telephone; Henry Alabaster, South Croydon, and Tom E. Gatehouse, Camberwell, County of Surrey, and Harry R. Kempe, Barnet, County of Middlesex, England.

314,305 Circuit for Telephonic Communication; Henry Alabaster, South Croydon, and Tom E Gatehouse, Camberwell, County of Surrey, England.

314,306 Telephone receiver; Henry Alabaster, South Croydon, and Tom E Gatehouse, Camberwell, County of Surrey, England.

314,307 Telephone Transmitter; Henry Alabaster, South Croydon, and Tom E. Gatehouse, Camberwell, County of Surrey, England.

314,312 Telephone; Fracis Blake, Weston, Mass.

314,371 Adjustable Support for Telephone Receiver; John M. Fitch, Detroit, Mich.

314,386 Electric Signaling Circuit; Thomas D. Lockwood, Boston, Mass.

314,418 Electric Arc Lamp; Clinton M. Ball, Troy, N. Y.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

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